

**UCLA**

Health System

**Antimicrobial  
Susceptibility  
Summary  
2015**

**Clinical Microbiology  
Department of Pathology & Laboratory Medicine**

# **Antimicrobial Susceptibility Summary**

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**UCLA Health System**

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The information contained in this booklet can also  
be found at:

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Select “Antimicrobial Susceptibility Summary”  
on left side of homepage

# Preface

This booklet contains up-to-date information to assist the clinician in making decisions concerning antimicrobial therapy and testing:

## **Antimicrobials (IV, PO):**

These tables summarize susceptibility data obtained for organisms isolated in the UCLA Clinical Microbiology Laboratory in 2014.

## **Percent Susceptible Data (Tables 1-14)**

## **Emerging Resistance Trends at UCLA (Tables 15-19)**

## **Antimicrobial Testing and Reporting Policies (Tables 27–28)**

In order to provide the most meaningful information, the laboratory is selective in reporting antimicrobial susceptibility results.

Reporting guidelines are based on:

1. Identity of the organism
2. Body site of culture
3. Overall antibiogram of the organism
4. Therapeutically relevant antimicrobials
5. Formulary status of the antimicrobial

Non-formulary drugs are not routinely reported and controlled formulary agents (Table 26) are reported only in the appropriate setting: e.g. amikacin and tobramycin if resistant to gentamicin. Results of all relevant drugs tested, including those not reported, are available upon request.

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# Guidelines for Interpretation of Minimal Inhibitory Concentrations (MICs)

MICs are interpreted as susceptible, intermediate, resistant, non-susceptible or susceptible dose dependent according to Clinical and Laboratory Standards Institute (CLSI) guidelines. When deciding whether the interpretation is meaningful, one should consider the antimicrobial pharmacokinetics, taking into account dosage and route of administration, the infecting organism and site of infection, and previous clinical experience. A common rule of thumb is that antimicrobial concentrations at the site of infection should be at least 2–4 times the MIC.

For additional information, please call the antimicrobial testing laboratory, or Antimicrobial Stewardship hotline.

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Frequently called numbers\*:

Antimicrobial Stewardship Hotline.....	310-267-7567
Antimicrobial Testing Laboratory.....	310-794-2760
Drug Information Center.....	310-267-8522
Infection Control (SMH-UCLA).....	424-259-4454
Infection Control (RRUMC).....	310-794-0187
Infectious Diseases (Adult).....	310-825-7225
Infectious Diseases (Pediatric).....	310-825-5235
Infectious Disease Pharmacist (page 92528).....	310-267-8510
Microbiology Fellow on-call.....	page 90103

\* If calling within UCLA system, dial the last 5 digits of the phone number.

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RRUMC – Ronald Reagan UCLA Medical Center  
 SMH-UCLA – Santa Monica Hospital-UCLA

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**Table 1. RRUMC: Adults (>21 y.o.) Five Most Common Gram-negative Bacteria – Non-Urine Isolates, % Susceptible**

Organism	Source	No. Isolates	Penicillins			Cephalosporins				Carbapenems			Aminoglycosides			Fluoro-quinolone	Other
			Ampicillin	Ampicillin-sulbactam	Piperacillin-tazobactam	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone	Ertapenem	Imipenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin	Trimethoprim – sulfamethoxazole
<i>Enterobacter cloacae</i>	OP	81	R <sup>1</sup>	R	94	R	99	—	—	99	99	99	99	99	99	96	93
	IP	36	R	R	72	R	86	—	—	86	99	99	99	97	97	97	97
	ICU	58	R	R	60	R	72	—	—	86	99	99	99	95	91	95	86
<i>Escherichia coli</i>	OP	244	43	50	95	58	88	85	84	99	99	99	99	81	84	67	61
	IP	97	23	29	89	41	83	79	71	99	99	99	98	79	81	54	53
	ICU	93	19	22	73	30	70	69	66	96	98	98	97	72	70	43	50
<i>Klebsiella pneumoniae</i>	OP	99	R	82	95	78	91	92	90	96	96	96	97	92	91	88	82
	IP	62	R	63	84	63	89	91	83	94	94	94	94	89	90	89	86
	ICU	86	R	56	73	54	78	79	77	87	89	89	90	81	80	78	70
<i>Proteus mirabilis</i>	OP	68	75	90	99	9	99	99	94	99	25	99	99	90	96	69	75
	IP	21 <sup>2</sup>	76	81	95	5	96	96	91	99	25	99	99	91	95	57	67
	ICU	18 <sup>2</sup>	50	56	94	11	89	89	72	99	23	99	94	83	78	50	50
<i>Pseudomonas aeruginosa</i>	OP	299	R	R	90	R	92	94	R	R	87	91	92	88	95	81	R
	IP	91	R	R	69	R	84	74	R	R	73	79	97	89	92	71	R
	ICU	119	R	R	68	R	75	72	R	R	61	67	92	86	90	71	R

OP, outpatient (includes EMC); IP, inpatient (excludes ICU); ICU, intensive care unit

<sup>1</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance).

<sup>2</sup> Calculated from fewer than the standard recommendation of 30 isolates

**Table 2. RRUMC: Adults (>21 y.o.) Gram-negative Bacteria – Non-Urine Isolates, % Susceptible**

Organism	No. Isolates	Penicillins			Cephalosporins				Carbapenems			Aminoglycosides			Fluoro-quinolone	Other
		Ampicillin	Ampicillin-sulbactam	Piperacillin-tazobactam	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone	Ertapenem	Imipenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin	Trimethoprim-sulfamethoxazole
<i>Citrobacter freundii</i> <sup>2</sup>	33	R <sup>1</sup>	R	82	R	88	—	—	91	90	91	99	82	85	82	73
<i>Enterobacter aerogenes</i>	80	R	R	75	R	96	—	—	98	92	99	99	99	99	99	99
<i>Enterobacter cloacae</i>	166	R	R	78	R	89	—	—	94	99	99	99	98	97	96	93
<i>Escherichia coli</i>	402	36	42	91	51	86	83	83	99	99	99	99	81	83	62	58
<i>Klebsiella oxytoca</i>	90	R	58	88	17	98	96	96	98	97	98	99	98	97	97	93
<i>Klebsiella pneumoniae</i>	234	R	71	88	68	88	87	85	94	94	94	95	89	89	86	80
<i>Morganella morganii</i> <sup>2</sup>	38	R	R	95	R	99	—	—	99	13	99	99	87	97	82	76
<i>Proteus mirabilis</i>	102	75	85	97	9	97	97	92	99	25	99	99	89	93	67	73
<i>Serratia marcescens</i>	100	R	R	97	R	99	—	—	99	89	99	99	99	98	96	98
<i>Acinetobacter baumannii</i>	40	R	60	40	R	48	50	—	R	66	66	65	55	63	50	70
<i>Pseudomonas aeruginosa</i>	469	R	R	85	R	89	88	R	R	81	86	93	89	94	80	R
<i>Stenotrophomonas maltophilia</i>	65	R	R	R	R	—	34	R	R	R	R	R	R	R	—	99

<sup>1</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance).

<sup>2</sup> Calculated from fewer than the standard recommendation of 30 isolates.



**Table 3. RRUMC: Adults (>21 y.o.) Gram-negative Bacteria – Urine Isolates, % Susceptible**

Organism	Source	No. Isolates	Penicillin	Cephalosporins			Carbapenems			Amino-glycosid	Fluoro-quinolone	Other	
			Ampicillin	Cefazolin <sup>4</sup>	Cefepime	Ceftriaxone <sup>1</sup>	Ertapenem	Imipenem	Meropenem	Gentamicin	Ciprofloxacin	Nitrofurantoin	Trimethoprim – sulfamethoxazole
<i>Enterobacter cloacae</i>	OP	75	R <sup>2</sup>	R	96	—	89	97	99	97	92	12	85
	IP	34	R	R	89	—	77	98	97	94	97	8	82
<i>Escherichia coli</i>	OP	5379	53	89	96	93	99	99	99	90	78	93	78
	IP	369	39	75	90	82	99	99	99	82	63	90	63
<i>Klebsiella pneumoniae</i>	OP	523	R	91	98	93	99	99	99	97	95	20	86
	IP	123	R	87	92	89	96	96	96	92	90	11	81
<i>Proteus mirabilis</i>	OP	253	81	94	99	96	98	10	99	92	80	R	79
	IP	55	75	97	98	95	93	0	99	91	80	R	75
<i>Pseudomonas aeruginosa</i> <sup>3</sup>	OP	118	R	R	88	R	R	77	85	96	72	R	R
	IP	66	R	R	88	R	R	77	86	99	86	R	R

OP, outpatient (includes EMC); IP, inpatient (includes all units and ICUs)

<sup>1</sup> Cefotaxime and ceftriaxone have comparable activity against *Enterobacteriaceae*

<sup>2</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance)

<sup>3</sup> Ceftazidime: OP 86%, IP 81%, Piperacillin-tazobactam: OP 80%, IP 75%

<sup>4</sup> Cefazolin interpretations (S, I, or R) predict activity to oral cephalosporins. Oral cephalosporins include cefpodoxime and ocephalexin for treatment of uncomplicated urinary tract infections.

**Table 4. RRUMC: Adults (>21 y.o.) Gram-positive Cocci, % Susceptible**

Organism	Source	No. Isolates	Penicillins			Amino-glycosides			Other									
			Ampicillin	Oxacillin	Penicillin	Gentamicin	Gentamicin synergy	Streptomycin synergy	Ciprofloxacin	Clindamycin	Daptomycin	Doxycycline	Erythromycin	Linezolid	Quinupristin-dalfopristin	Rifampin	Trimethoprim-sulfamethoxazole	Vancomycin
<i>Staphylococcus aureus</i> <sup>1</sup>	All	1473	—	69	<10	81	—	—	63	75	99	98	52	99	99	99	98	99
Oxacillin-resistant <i>S. aureus</i> (MRSA) <sup>1,6</sup>	OP	347	—	0	0	99	—	—	19	61	99	96	10	99	99	98	96	99
	IP	78	—	0	0	50	—	—	15	53	99	95	14	99	99	98	95	99
	ICU	68	—	0	0	67	—	—	12	49	99	96	10	99	99	96	96	99
Oxacillin-susceptible <i>S. aureus</i> (MSSA)	OP	781	—	100	<10	92	—	—	82	81	99	98	68	99	99	99	99	99
	IP	104	—	100	<10	99	—	—	81	76	99	98	63	99	99	99	99	99
	ICU	135	—	100	<10	67	—	—	86	87	99	99	81	99	99	97	99	99
Coagulase-negative <i>Staphylococcus</i> <sup>1, 2</sup>	All	385	—	43	<10	69	—	—	47	68	99	92	36	99	99	94	65	99
<i>Enterococcus</i> spp. <sup>3,7</sup>	All	564	72	—	—	R	78	70	35	R	97	34	—	99	32	18	R	76
<i>Enterococcus faecalis</i> <sup>4,7</sup>	All	42	99	—	—	R	81	86	52	R	99	36	—	99	R	26	R	98
<i>Enterococcus faecium</i> <sup>5,7</sup>	All	90	7	—	—	R	94	47	1	R	90	44	—	99	97	4	R	21

OP, outpatient (includes EMC); IP, inpatient (excludes ICU); ICU, intensive care unit

<sup>1</sup> *Staphylococcus* resistant to oxacillin are resistant to cefazolin, cephalexin, ceftriaxone and all other beta-lactams except ceftaroline

<sup>2</sup> *S. saprophyticus* urinary tract infections respond to antibiotic concentrations achieved in urine with agents commonly used to treat acute uncomplicated UTIs

<sup>3</sup> Includes isolates identified to genus only (non-sterile sites) and those identified to species (sterile sites)

<sup>4</sup> Sterile sites; 10% High-level resistance to both gentamicin and streptomycin

<sup>5</sup> Sterile sites; 5% High-level resistance to both gentamicin and streptomycin

<sup>6</sup> MRSA are 100% susceptible to ceftaroline.

<sup>7</sup> Serious Enterococcal infections need combination therapy with Ampicillin, Penicillin, and Vancomycin plus and Aminoglycoside. SYNERGY occurs only when BOTH drugs are SUSCEPTIBLE. Infectious Disease consult suggested.

**Table 4. RRUMC: Adults (>21 y.o.) Gram-positive Cocci, % Susceptible (cont.)**

Organism	No. Isolates	Penicillins		Cephalosporins		Other					
		Amoxicillin	Penicillin	Cefotaxime	Ceftriaxone	Clindamycin	Doxycycline	Erythromycin	Levofloxacin	Trimethoprim – sulfamethoxazole	Vancomycin
<i>Streptococcus pneumoniae</i>	22 <sup>4</sup>	90	—	—	—	74	75	59	99	75	100
Meningitis <sup>1</sup>		—	55	75	80	—	—	—	—	—	—
Non-meningitis <sup>2</sup>		—	95	85	99	—	—	—	—	—	—
Viridans group <i>Streptococcus</i>	69	—	51 <sup>3</sup>	97	99	—	—	—	—	—	100
beta-hemolytic group <i>Streptococcus</i> spp.	All remain predictably susceptible to penicillin; resistance rates nationwide for Group B streptococci ( <i>S. agalactiae</i> ) are approximately 50% for erythromycin and 30% for clindamycin. Resistance rates for Group A streptococci ( <i>S. pyogenes</i> ) can be as high as 25% for erythromycin, 5% for clindamycin and 20% for tetracyclines.										

<sup>1</sup> % susceptible for penicillin, cefotaxime and ceftriaxone applies to patients with meningitis.

<sup>2</sup> % susceptible for penicillin, cefotaxime and ceftriaxone applies to patients without meningitis.

<sup>3</sup> Resistant (R) includes 49% Intermediate (MIC 0.25-2 µg/ml) and 0% High-level (MIC >2 µg/m) R.

<sup>4</sup> Calculated from fewer than the standard recommendation of 30 isolates.



**Table 5. RRUMC: Miscellaneous Gram-negative Bacteria**

<b>Organism</b>	<b>No. Strains</b>	<b>% beta-lactamase positive<sup>1</sup></b>
<b><i>Haemophilus influenzae</i></b>	<b>45 (pts. &gt;21 y.o)</b>	<b>28</b>
	<b>19 (pts. ≤21 y.o.)</b>	<b>31</b>
<b><i>Moraxella catarrhalis</i></b>	<b>32 (pts. &gt;21 y.o)</b>	<b>89</b>
	<b>15 (pts. ≤21 y.o.)</b>	<b>99</b>
<b><i>Neisseria gonorrhoeae</i></b>	<p>Because of increasing incidence of fluoroquinolone (e.g. ciprofloxacin) resistance and concerns for cefixime resistance in California, the current therapy recommendation is ceftriaxone in combination with azithromycin or doxycycline. Routine susceptibility testing not performed due to low incidence of ceftriaxone resistance. However, culture and susceptibility testing should be performed in cases of treatment failure. See <a href="http://www.cdc.gov/std/Gonorrhea/treatment.htm">http://www.cdc.gov/std/Gonorrhea/treatment.htm</a></p>	
<b><i>Neisseria meningitidis</i></b>	<p><i>Neisseria meningitidis</i> remain susceptible to penicillin and ceftriaxone, the drugs of choice for treating meningococcal infections. However, reports (MMWR. 2008. 57:173-175) have noted some isolates with resistance to fluoroquinolones, agents often used for prophylaxis.</p>	

<sup>1</sup> Resistant to ampicillin, amoxicillin, and penicillin

**Table 6. RRUMC: *Pseudomonas aeruginosa* – %Susceptible to One or Two Antimicrobials**

Information provided for two drugs does NOT imply synergism, antagonism or likely activity in vivo; 743 patients, included the most resistant result for each drug if patient had >1 isolate

	Amikacin (95) <sup>1</sup>	Gentamicin (91)	Tobramycin (95)	Ciprofloxacin (79)
Cefepime (87)	98 <sup>2</sup>	97	98	95
Meropenem (86)	99	98	98	93
Piperacillin-tazobactam (84)	99	97	98	93
Ciprofloxacin (79)	98	96	97	–

<sup>1</sup> Percent susceptible for individual drug in parenthesis

<sup>2</sup> Percent susceptible for either or both drugs (e.g. %S to amikacin and/or cefepime)

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**Table 7. RRUMC: Pediatrics ( ≤ 21 y.o.) Gram-negative Bacteria – Non-Urine Isolates, % Susceptible**

Organism	No. Isolates	Penicillins			Cephalosporins				Carbapenems		Aminoglycosides			Fluoroquinolone	Other
		Ampicillin	Ampicillin-subactam	Piperacillin-tazobactam	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone	Imipenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin <sup>1</sup>	Trimethoprim – sulfamethoxazole
<i>Enterobacter cloacae</i> <sup>3</sup>	34	R <sup>2</sup>	R <sup>2</sup>	76	R <sup>2</sup>	91	76	73	99	99	99	99	99	99	91
<i>Escherichia coli</i>	53	58	62	96	66	95	94	92	99	99	99	89	89	75	69
<i>Klebsiella pneumoniae</i> <sup>3</sup>	33	R <sup>2</sup>	73	94	82	88	91	88	94	94	97	91	94	85	79
<i>Serratia marcescens</i> <sup>3</sup>	13	R <sup>2</sup>	R	92	R <sup>2</sup>	99	99	83	70	99	99	92	83	92	99
<i>Pseudomonas aeruginosa</i>	81	R <sup>2</sup>	R	81	R <sup>2</sup>	84	81	R <sup>2</sup>	82	85	96	90	96	88	R <sup>2</sup>

<sup>1</sup> Ciprofloxacin is associated with arthropathy and histological changes in weight-bearing joints of juvenile animals and is currently not FDA approved for pediatric use.

<sup>2</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance).

<sup>3</sup> Calculated from fewer than the standard recommendation of 30 isolates

**Table 8. RRUMC: Pediatrics ( ≤ 21 y.o.) Gram-negative Bacteria – Urine Isolates, % Susceptible**

Organism	No. Isolates	Penicillins		Cephalosporins				Carbapenems		Aminoglycosides			Fluoroquinolone	Other	
		Ampicillin	Ampicillin-sulbactam	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone <sup>1</sup>	Imipenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin <sup>2</sup>	Trimethoprim – sulfamethoxazole	Nitrofurantoin
<i>Enterobacter cloacae</i> <sup>3</sup>	15	R <sup>4</sup>	R	R	99	—	69	93	99	99	99	99	92	85	8
<i>Escherichia coli</i>	446	56	62	90	97	—	94	99	99	99	93	71	91	77	95
<i>Klebsiella pneumoniae</i>	47	R	79	93	99	—	96	99	99	99	96	—	96	81	13
<i>Proteus mirabilis</i>	45	81	95	95	98	—	99	—	99	99	91	—	95	86	R
<i>Pseudomonas aeruginosa</i>	326	R	R	R	85	—	R	80	86	99	96	99	88	R	R

<sup>1</sup> Cefotaxime and ceftriaxone have comparable activity against *Enterobacteriaceae*.

<sup>2</sup> Ciprofloxacin is associated with arthropathy and histological changes in weight-bearing joints of juvenile animals and is not FDA approved for pediatric use.

<sup>3</sup> Calculated from fewer than the standard recommendation of 30 isolates.

<sup>4</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance).

**Table 9. RRUMC: Pediatrics ( ≤ 21 y.o.) Gram-positive Cocci, % Susceptible**

Organism	Source	No. Isolates	Penicillins			Cephalosporins		Aminoglycosides		Other									
			Ampicillin	Oxacillin	Penicillin	Ceftriaxone	Cefotaxime	Gentamicin synergy	Streptomycin synergy	Ciprofloxacin <sup>1</sup>	Clindamycin	Daptomycin	Doxycycline	Erythromycin	Linezolid	Quinupristin-dalfopristin	Rifampin	Trimethoprim-sulfamethoxazole	Vancomycin
<i>Staphylococcus aureus</i> (All) <sup>2</sup>	OP	191	-	80	<10	-	-	-	-	79	82	99	97	61	99	99	98	99	99
	IP	95	-	70	<10	-	-	-	-	67	72	99	97	57	99	99	98	97	99
Oxacillin-resistant <i>S. aureus</i> (MRSA) <sup>2</sup>	OP	39	-	0	0	-	-	-	-	33	80	99	95	21	99	99	95	97	99
	IP <sup>3</sup>	29	-	0	0	-	-	-	-	7	59	99	93	28	99	97	93	90	99
Oxacillin-susceptible <i>S. aureus</i> (MSSA)	OP	154	-	100	<10	-	-	-	-	90	84	99	97	71	99	99	99	99	99
	IP	67	-	100	<10	-	-	-	-	94	78	99	99	70	99	99	99	99	99
<i>Coagulase negative Staphylococcus</i> (sterile body sites)	OP <sup>3</sup>	26	-	31	<10	-	-	-	-	65	81	99	92	42	99	99	96	62	99
	IP	39	-	31	<10	-	-	-	-	64	64	99	95	18	99	99	99	64	99
<i>Enterococcus</i> spp. <sup>4</sup>	All	53	81	-	-	R <sup>6</sup>	R	75	84	51	R	96	29	-	99	28	33	R	87
<i>Enterococcus faecalis</i> <sup>3,5</sup>	All <sup>3</sup>	10	99	-	-	R	R	70	90	50	R	99	30	-	99	R	20	R	99
<i>Enterococcus faecium</i> <sup>3,5</sup>	All <sup>3</sup>	5	0	-	-	R	R	99	40	0	R	80	60	-	99	80	40	R	20
<i>Viridans group Streptococcus</i> <sup>3</sup> (sterile body sites)	All <sup>3</sup>	8	-	-	50	88	88	-	-	-	-	-	-	-	-	-	-	-	100

OP, outpatient (includes EMC); IP, inpatient (includes ICU)

<sup>1</sup> Ciprofloxacin is associated with arthropathy and histological changes in weight bearing joints of juvenile animals and is not FDA approved for pediatric use.

<sup>2</sup> *Staphylococcus* resistant to oxacillin are resistant to cefazolin, cephalexin, ceftriaxone and all other beta-lactams except ceftaroline.

<sup>3</sup> Calculated from fewer than the standard recommendation of 30 isolates.

<sup>4</sup> Includes isolates identified to genus only (non-sterile body sites) and those identified to species (sterile body sites).

<sup>5</sup> Sterile sites; 7% High-level resistance to both gentamicin and streptomycin.

<sup>6</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance)



**Table 9. RRUMC: Pediatrics ( ≤ 21 y.o.) Gram-positive Cocci, % Susceptible (cont.)**

Organism	No. Isolates	Penicillins		Cephalosporins		Other				
		Amoxicillin	Penicillin	Cefotaxime	Ceftriaxone	Clindamycin	Doxycycline	Erythromycin	Trimethoprim - sulfamethoxazole	Vancomycin
<i>Streptococcus pneumoniae</i>	14 <sup>1</sup>	93		—	—	79	93	79	79	100
Meningitis <sup>2</sup>		—	71	93	93	—	—	—	—	—
Non-meningitis <sup>3</sup>		—	92	93	93	—	—	—	—	—

<sup>1</sup> Calculated from fewer than standard recommendation of 30 isolates

<sup>2</sup> % susceptible for penicillin, cefotaxime and ceftriaxone applies to patients with meningitis.

<sup>3</sup> % susceptible for penicillin, cefotaxime and ceftriaxone applies to patients without meningitis.



**Table 10. RRUMC: Yeasts, % Susceptible, 2011-2014**

- When antifungal therapy is necessary, most yeast infections can be treated empirically. Antifungal testing of yeasts may be warranted for the following:
  - 1) oropharyngeal infections due to *Candida* spp. in patients who appear to be failing therapy
  - 2) management of invasive *Candida* spp. infections when utility of an azole agent is uncertain (e.g., *Candida* spp. other than *C. albicans*), per IDSA guidelines for candidiasis: CID 2009:48, 503. Clinical Practice Guidelines for the Management of Candidiasis: 2009
- Yeast isolates from sterile body sites are tested every 7 days; isolates from other sources are tested upon special request.
- Only fluconazole is reported unless fluconazole resistance is detected.

Organism	No. Isolates <sup>2</sup>	Percent Susceptible/Dose Dependent/Resistant at Breakpoints <sup>1</sup> (µg/ml)							
		Fluconazole			Caspofungin	Voriconazole			Flucytosine
		≤ 8 S	16-32 S-DD	≥64 R	≤ 2 S	≤ 1 S	2 S-DD	≥4 R	≤ 4 S
<i>C. albicans</i> <sup>3</sup>	162	99	1	1	100	98	0	2	96
<i>C. glabrata</i>	147	43	37	20	99	90	6	4	99
<i>C. parapsilosis</i>	47	100	0	0	97	100	0	0	97
<i>C. tropicalis</i>	36	98	0	2	98	97	0	3	94
<i>C. krusei</i> <sup>4</sup>	25	R <sup>5</sup>	R	R	100	96	4	0	39

<sup>1</sup> S = Susceptible. S-DD = Susceptible dose dependent; susceptibility dependent on achieving maximal possible blood level; no dose dependent category for flucytosine and caspofungin. R = Resistant

<sup>2</sup> Not all isolates were tested against all four antifungal agents.

<sup>3</sup> *C. albicans* usually susceptible to fluconazole

<sup>4</sup> Calculated from fewer than the standard recommendation of 30 isolates

<sup>5</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance)

**Table 11. RRUMC: Yeasts, Cumulative % Susceptible at MIC, 2010-2014**

**Fluconazole (µg/ml)**

Organism	No. Isolates	≤1	2.0	4.0	8.0	16.0	32.0	64.0	>64
<i>C. albicans</i>	162	93	95	96	98	99	99	99	100
<i>C. glabrata</i>	147	2	6	20	43	66	80	89	100
<i>C. parapsilosis</i>	47	87	100	—	—	—	—	—	—
<i>C. tropicalis</i>	36	88	94	97	97	97	97	97	100
<i>C. krusei</i>	—	intrinsically resistant to fluconazole							

**Voriconazole (µg/ml)**

Organism	No. Isolates	≤0.12	0.25	0.5	1.0	2.0	4.0	8	>8
<i>C. albicans</i>	162	93	94	97	98	98	98	98	100
<i>C. glabrata</i>	147	26	45	74	89	95	99	100	—
<i>C. parapsilosis</i>	47	100	—	—	—	—	—	—	—
<i>C. tropicalis</i> <sup>1</sup>	36	88	94	97	97	97	100	—	—
<i>C. krusei</i> <sup>1</sup>	25	8	37	92	96	100	—	—	—

**Caspofungin (µg/ml)**

Organism	No. Isolates	≤0.25	0.5	1.0	2.0	>2.0
<i>C. albicans</i>	162	98	99	99	99	100
<i>C. glabrata</i>	147	89	95	97	98	100
<i>C. parapsilosis</i>	47	19	77	96	98	100
<i>C. tropicalis</i>	36	97	97	97	100	—
<i>C. krusei</i> <sup>1</sup>	25	76	96	100	—	—

**Amphotericin (µg/ml)**

Organism	No. Isolates	≤0.03	0.06	0.12	0.25	0.5	1.0	2.0	>2.0
<i>C. albicans</i>	162	0	0	1	1	3	62	100	—
<i>C. glabrata</i>	147	0	1	1	1	3	19	100	—
<i>C. parapsilosis</i>	47	0	0	0	0	0	38	100	—
<i>C. tropicalis</i>	36	0	0	0	0	0	19	100	—
<i>C. krusei</i> <sup>1</sup>	25	0	0	0	0	0	0	96	100

<sup>1</sup> Calculated from fewer than the standard recommendation of 30 isolates

**Table 12. SMH-UCLA: Non-Urine Gram-negative Bacteria, % Susceptible**

**Outpatients**

Organism	No. Isolates	Penicillins			Cephalosporins				Carbapenems			Aminoglycosides			Fluoro-quinolone	Other
		Ampicillin	Ampicillin-sulbactam	Piperacillin-tazobactam	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone <sup>1</sup>	Ertapenem	Imipenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin	Trimethoprim – sulfamethoxazole
<i>Escherichia coli</i>	133	40	48	97	55	–	84	80	98	99	99	99	80	84	66	56
<i>Pseudomonas aeruginosa</i>	88	R <sup>2</sup>	R <sup>2</sup>	78	R <sup>2</sup>	78	82	R <sup>2</sup>	R <sup>2</sup>	82	84	96	87	90	78	R <sup>2</sup>

**Inpatients**

Organism	No. Isolates	Penicillins			Cephalosporins				Carbapenems			Aminoglycosides			Fluoro-quinolone	Other
		Ampicillin	Ampicillin-sulbactam	Piperacillin-tazobactam	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone <sup>1</sup>	Ertapenem	Imipenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin	Trimethoprim – sulfamethoxazole
<i>Enterobacter cloacae</i>	21 <sup>3</sup>	R <sup>2</sup>	R <sup>2</sup>	80	R <sup>2</sup>	90	–	–	85	99	99	99	99	99	90	90
<i>Escherichia coli</i>	78	37	41	85	51	78	79	77	99	99	99	99	81	81	50	59
<i>Klesiella pneumoniae</i>	43	R <sup>2</sup>	63	78	66	78	73	73	88	90	88	91	95	76	81	73
<i>Proteus mirabilis</i>	40 <sup>3</sup>	43	69	99	8	98	83	74	99	21	99	97	77	89	49	51
<i>Serratia marcescens</i>	15 <sup>3</sup>	R <sup>2</sup>	R <sup>2</sup>	86	R <sup>2</sup>	99	–	–	99	86	99	93	93	93	86	99
<i>Pseudomonas aeruginosa</i>	108	R <sup>2</sup>	R <sup>2</sup>	70	R <sup>2</sup>	72	73	R <sup>2</sup>	R <sup>2</sup>	62	66	97	86	90	63	R <sup>2</sup>

<sup>1</sup> Cefotaxime and ceftriaxone have comparable activity against *Enterobacteriaceae*

<sup>2</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance).

<sup>3</sup> Calculated from fewer than the standard recommendation of 30 isolates

**Table 13. SMH-UCLA: Urine Gram-negative Bacteria, % Susceptible**

Organism	Source	No. Isolates	Penicillins		Cephalosporins				Carbapenems			Aminoglycosides			Fluoro-quinolone	Other	
			Ampicillin	Piperacillin-tazobactam	Cefazolin	Cefepime	Ceftriaxone <sup>1</sup>	Ceftazidime	Ertapenem	Imipenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin	Nitrofurantoin	Trimethoprim – sulfamethoxazole
<i>Escherichia coli</i>	OP	1601	51	—	89	95	91	—	99	99	99	99	90	76	77	93	70
	IP	232	45	—	83	91	85	—	99	99	99	99	89	99	55	91	66
<i>Klebsiella pneumoniae</i>	OP	157	R <sup>2</sup>	—	92	96	90	—	96	96	96	98	93	38	90	23	85
	IP	69	R <sup>2</sup>	—	87	94	88	—	96	96	96	98	92	—	88	18	88
<i>Proteus mirabilis</i>	OP	114	76	—	92	99	94	—	98	—	99	99	90	80	73	R <sup>2</sup>	69
	IP	46	74	—	92	99	93	—	96	—	99	99	89	—	59	R <sup>2</sup>	67
<i>Pseudomonas aeruginosa</i>	OP	57	R <sup>2</sup>	80	R <sup>2</sup>	83	R <sup>2</sup>	83	R <sup>2</sup>	83	87	99	94	96	71	R <sup>2</sup>	R <sup>2</sup>
	IP	45	R <sup>2</sup>	67	R <sup>2</sup>	81	R <sup>2</sup>	78	R <sup>2</sup>	62	72	98	86	88	52	R <sup>2</sup>	R <sup>2</sup>

OP, outpatient (includes EMC); IP, inpatient (includes ICU)

<sup>1</sup> Cefotaxime and ceftriaxone have comparable activity against *Enterobacteriaceae*

<sup>2</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance)

**Table 14. SMH-UCLA (Inpatient): Gram-positive Cocci, % Susceptible**

Organism	No. Isolates	Penicillins			Cephalosporin	Fluoroquinolones		Tetracyclines		Other								
		Ampicillin	Oxacillin	Penicillin		Ceftriaxone	Ciprofloxacin	Levofloxacin	Doxycycline	Tetracycline	Clindamycin	Daptomycin	Erythromycin	Nitrofurantoin	Linezolid	Quinupristin-dalfopristin	Rifampin	Trimethoprim-sulfamethoxazole
<i>Staphylococcus aureus</i> (All)	230	—	49	<10	—	41	—	99	—	67	99	40	—	99	99	99	99	99
oxacillin-resistant (MRSA) <sup>1</sup>	108	—	—	—	—	7	—	99	—	50	99	10	—	99	99	95	95	99
oxacillin-susceptible (MSSA)	105	—	100	<10	—	77	—	99	—	85	99	70	—	99	99	99	99	99
<i>Staphylococcus</i> , coagulase negative <sup>2</sup>	48	—	23	<10	—	40	—	83	—	51	99	34	—	99	99	97	51	99
<i>Enterococcus</i> spp. (all) <sup>3,4</sup>	113	63	—	27	R <sup>6</sup>	—	—	34	—	R	99	—	—	99	40 <sup>5</sup>	—	R	65
<i>Enterococcus</i> spp. (urine)	129	60	—	22	R	26	—	—	—	R	—	—	63	—	—	—	R	61

<sup>1</sup> *Staphylococcus* resistant to oxacillin are resistant to cefazolin, cephalexin, ceftriaxone and all other beta-lactams except ceftaroline

<sup>2</sup> *S. saprophyticus* urinary tract infections respond to antibiotic concentrations achieved in urine with agents commonly used to treat acute uncomplicated UTIs

<sup>3</sup> Includes 9 *E. faecalis*, 6 *E. faecium*, and 114 isolates not identified to species level

<sup>4</sup> Gentamicin synergy 84% susceptible, streptomycin synergy 62% susceptible

<sup>5</sup> Only *E. faecium* are susceptible

<sup>6</sup> R = intrinsic resistance (inherent or innate antimicrobial resistance)

**Table 15. RRUMC: Emerging Resistance Concerns**

When unusual antimicrobial resistance (R) is observed, an Infectious Disease (ID) consult is strongly suggested to optimize therapy and prevent nosocomial transmission.

Organism	Resistant to:	Percent Resistant:	Therapeutic Options	Comments
<i>Staphylococcus aureus</i>	oxacillin (MRSA)	Inpatients (n=624) 38% Outpatients (n=1128) 31%	vancomycin ceftaroline (100%)	Oxacillin-resistant <i>S. aureus</i> are clinically resistant to all $\beta$ -lactams, $\beta$ -lactam / $\beta$ -lactamase inhibitor combinations and carbapenems, excluding ceftaroline. <sup>1</sup> Fluoroquinolones are also usually inactive.
<i>Streptococcus pneumoniae</i> (non-meningitis)	penicillin (MIC > 2 $\mu$ g/ml)	All isolates (n = 22) 5%	ceftriaxone or cefotaxime or vancomycin	If susceptible (MIC $\leq$ 2.0 $\mu$ g/ml), high dose penicillin has been shown to be effective for infections other than meningitis. <sup>1</sup>
<i>Streptococcus pneumoniae</i> (non-meningitis)	cefotaxime, ceftriaxone (penicillin resistant always)	All isolates (n = 22) low level R 15% high level R 0%	vancomycin levofloxacin	If low-level resistance (MIC=2.0 $\mu$ g/ml), high dose cefotaxime or ceftriaxone may be effective for infections other than meningitis. <sup>1</sup>

**Table 15. RRUMC: Emerging Resistance Concerns (cont.)**

When unusual antimicrobial resistance (R) is observed, an Infectious Disease (ID) consult is strongly suggested to optimize therapy and prevent nosocomial transmission.

Organism	Resistant to:	Percent Resistant:	Therapeutic Options	Comments
Viridans group <i>Streptococcus</i>	penicillin	Blood isolates (n = 51) low level R 28% high level R 2%	penicillin + aminoglycoside or vancomycin	Level of penicillin resistance is particularly useful in guiding therapy for endocarditis. <sup>1</sup> For low level resistance, MICs are 0.25–2.0 µg/ml; for high level, MICs are >2.0 µg/ml.
<i>Enterococcus</i> spp.	vancomycin (VRE)	Blood isolates <i>E. faecium</i> (n = 83) 84% <i>E. faecalis</i> (n = 35) 0%	Check in vitro susceptibility results and contact Infectious Diseases.	Vancomycin-resistant <i>Enterococcus</i> (VRE) are often resistant to many potentially useful agents. Therapeutic management must be determined on a case-by-case basis.
	gentamicin synergy screen (GENT)  streptomycin synergy screen (STR)	Blood isolates <i>E. faecium</i> (n = 59) GENT 6% STR 58% <i>E. faecalis</i> (n = 45) GENT 23% STR 14%	Check in vitro susceptibility results and contact Infectious Diseases.	Both aminoglycoside and cell wall active agent (ampicillin, penicillin, or vancomycin) must be susceptible for synergistic interaction.



**Table 15. RRUMC: Emerging Resistance Concerns (cont.)**

Organism	Resistant to:	Percent Resistant:	Therapeutic Options	Comments
<i>Klebsiella</i> spp. <i>E. coli</i>	ceftriaxone or other 3rd generation cephalosporin	Blood isolates: <i>Klebsiella</i> spp. (n=79) 14% <i>E. coli</i> (n =132) 24%	ertapenem aminoglycoside ciprofloxacin	In vitro resistance to 3rd generation cephalosporins suggests the strain is producing extended-spectrum $\beta$ -lactamases (ESBL),
<i>K. pneumoniae</i> and other <i>Enterobacteriaceae</i>	carbapenem	All isolates: <1%	Check in vitro susceptibility results and contact Infectious Diseases.	Decreased susceptibility to carbapenems is increasing primarily among ICU patients' isolates. These isolates may be resistant to all available antimicrobial agents. See Table 16.
<i>Acinetobacter</i> spp. <i>Citrobacter freundii</i> <i>Enterobacter</i> spp. <i>Providencia</i> spp. / <i>Proteus</i> spp. (except <i>P. mirabilis</i> ) <i>Serratia marcescens</i>	3rd generation cephalosporins (e.g. ceftriaxone)	See comments	aminoglycoside ciprofloxacin ertapenem meropenem trimeth-sulfa	Organisms listed typically produce inducible $\beta$ -lactamases. Isolates that appear susceptible to 3rd generation cephalosporins may develop resistance during therapy. <sup>1</sup> Judicious use of 3rd generation cephalosporins is needed to curtail the increase in cephalosporin-resistant <i>Enterobacteriaceae</i> . (i. e. ceftazidime should be reserved for highly suspected or documented pseudomonal infections).
<i>Pseudomonas aeruginosa</i>	cefepime and/or piperacillin-tazobactam	All isolates: (n=800) 16%	Check in vitro susceptibility results and contact Infectious Diseases.	Combination therapy with a beta-lactam plus ciprofloxacin or an aminoglycoside (with susceptible results in vitro) should be considered. Therapeutic management must be determined on a case by case basis.
<i>Acinetobacter baumannii</i>	amikacin, ampicillin-sulbactam, cefepime, ceftazidime, ciprofloxacin, meropenem, pip-tazo, trimeth-sulfa	All isolates: (n=54) 15%	Check in vitro susceptibility results and contact Infectious Diseases.	Therapeutic management must be determined on a case by case basis.

**Table 15. RRUMC: Emerging Resistance Concerns (cont.)**

When specific antimicrobial resistance (R) is detected, an Infectious Disease (ID) consult is strongly suggested.

Organism	Resistant to:	Therapeutic Options	Comments
<i>Candida krusei</i>	fluconazole	caspofungin amphotericin voriconazole	Typically resistant to fluconazole. <sup>3, 4</sup>
<i>Candida glabrata</i>	fluconazole	caspofungin amphotericin voriconazole	Typically resistant to fluconazole. <sup>3, 4</sup> Caspofungin resistance may be emerging.
<i>Candida albicans</i>	fluconazole	caspofungin amphotericin	Typically susceptible to fluconazole but resistance can develop during therapy. Amphotericin is the drug of choice for systemic infections in patients without baseline renal dysfunction. <sup>3, 4</sup>

For additional resistance data, see Tables 5-14.

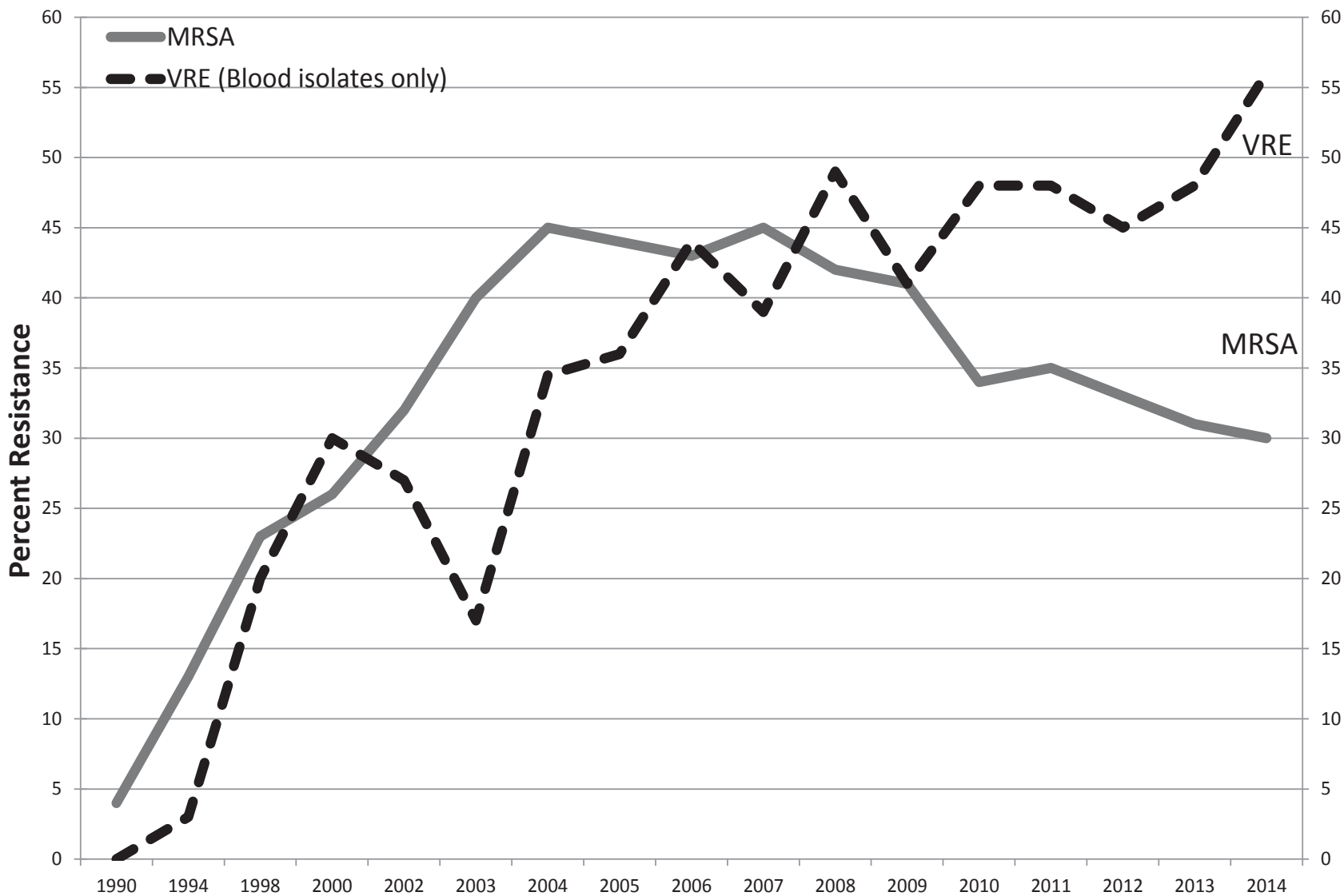
1 The Sanford Guide. 2014

2 Circulation. 2005. **23**:e394

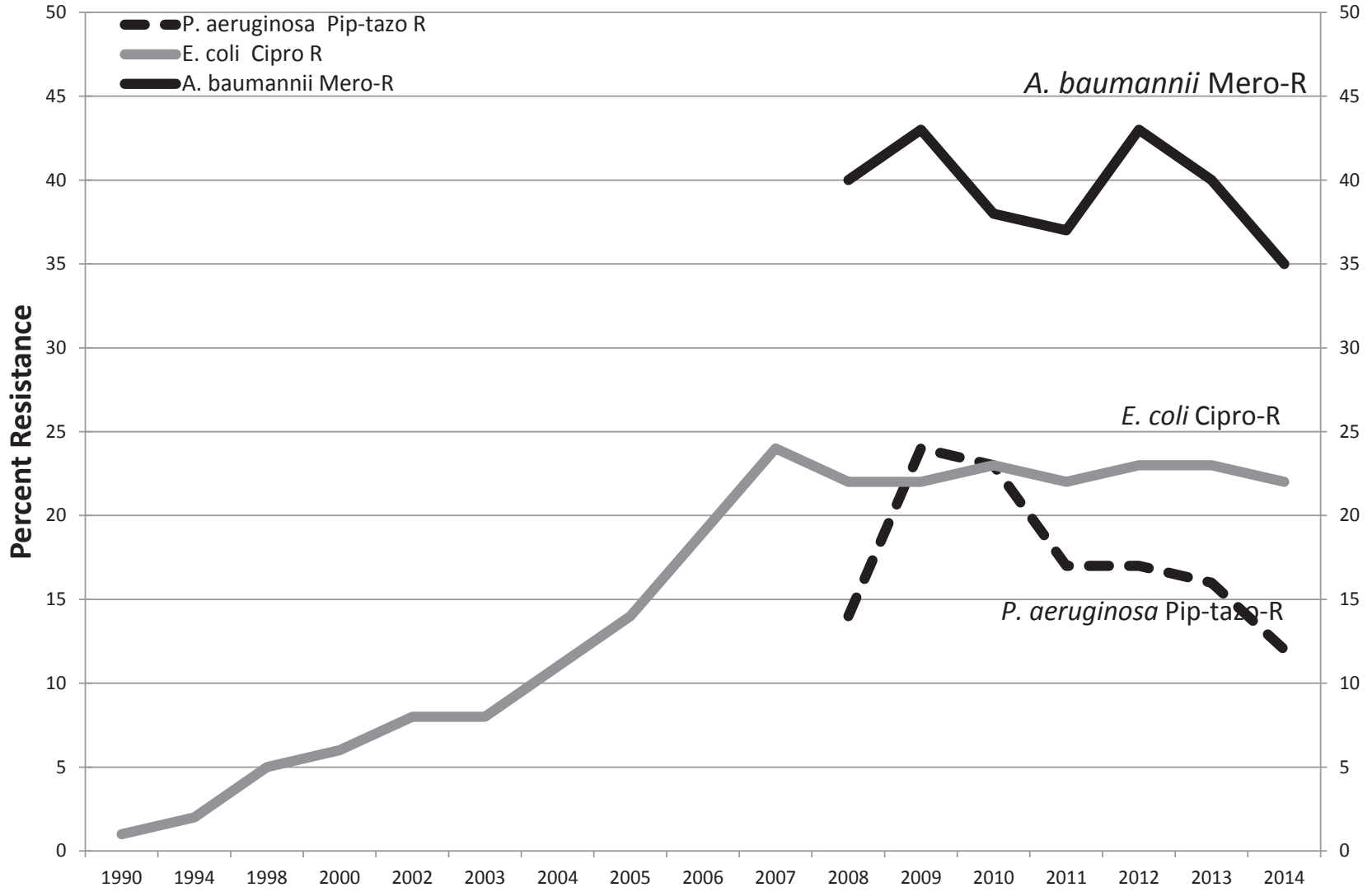
3 Clin. Infect. Dis. 2006. **42**:244–251

4 Treatment Guidelines from the Med. Letter-Antifungal Drugs. 2009. **7**:1–10

**Table 16. Resistance Trends: RRUMC, 1990-2014**

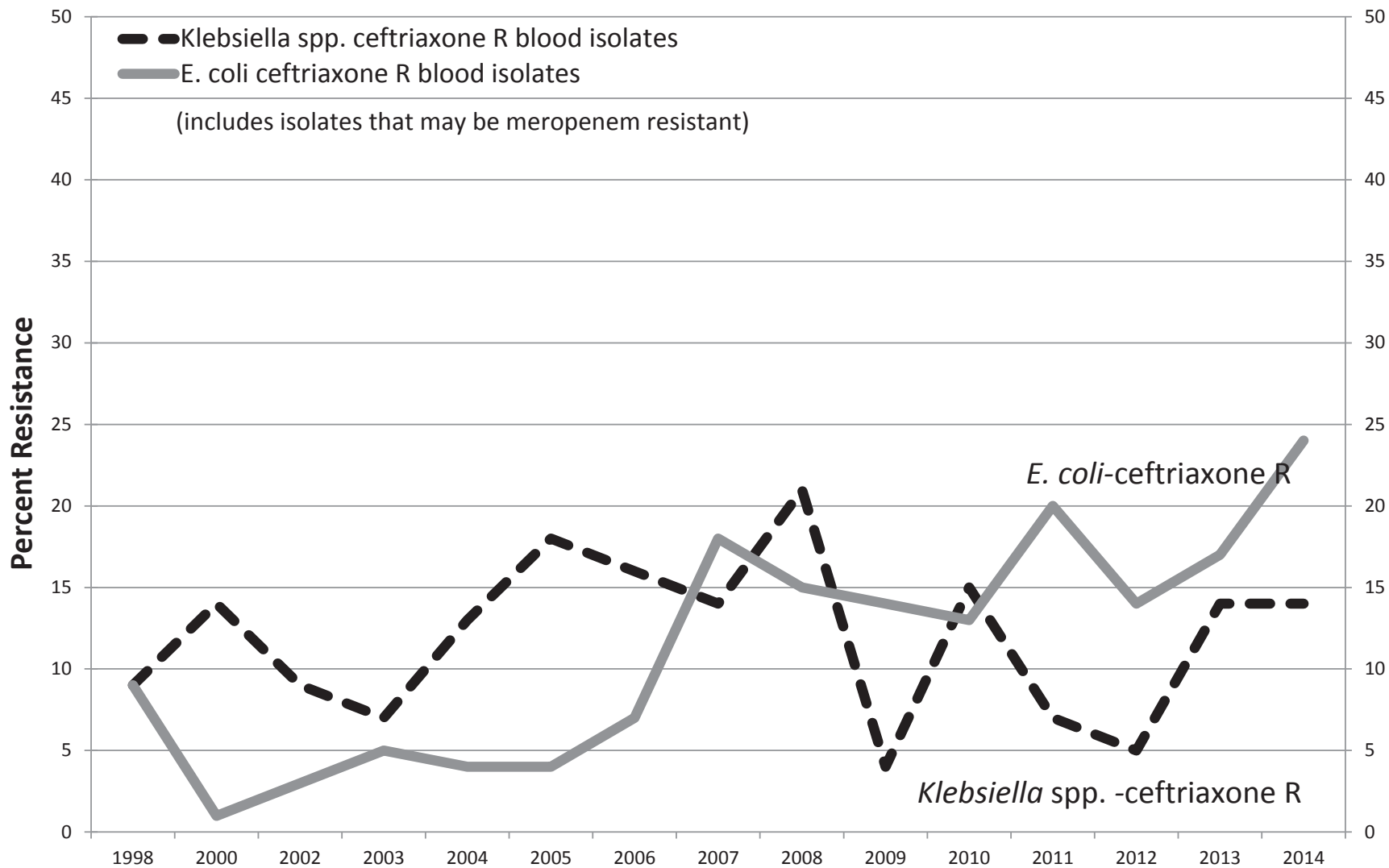


**Table 16. Resistance Trends: RRUMC, 1990-2014  
(cont.)**



**Table 16. Resistance Trends: RRUMC, 1990-2014  
(cont.)**

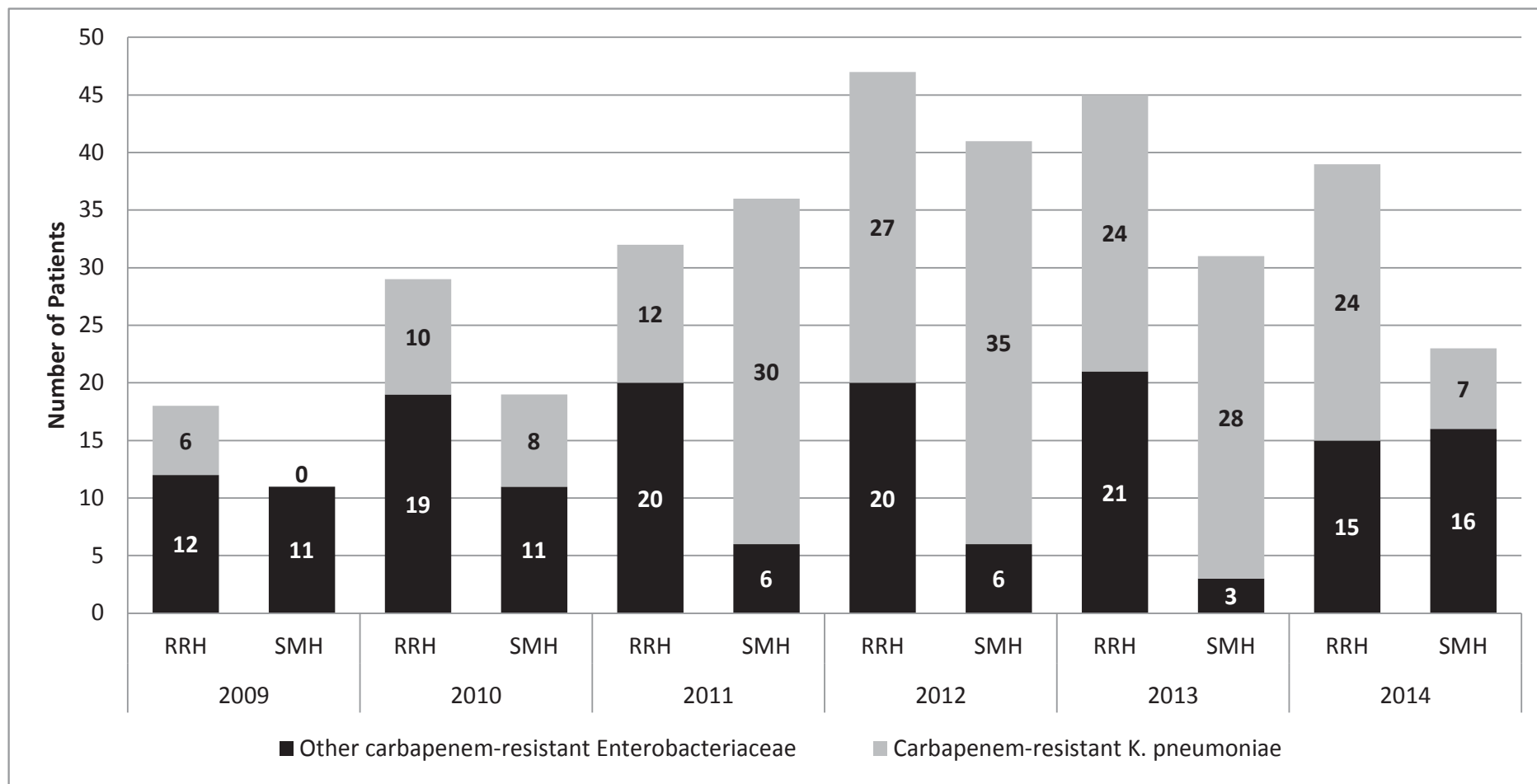
23



Note: No data prior to 1998



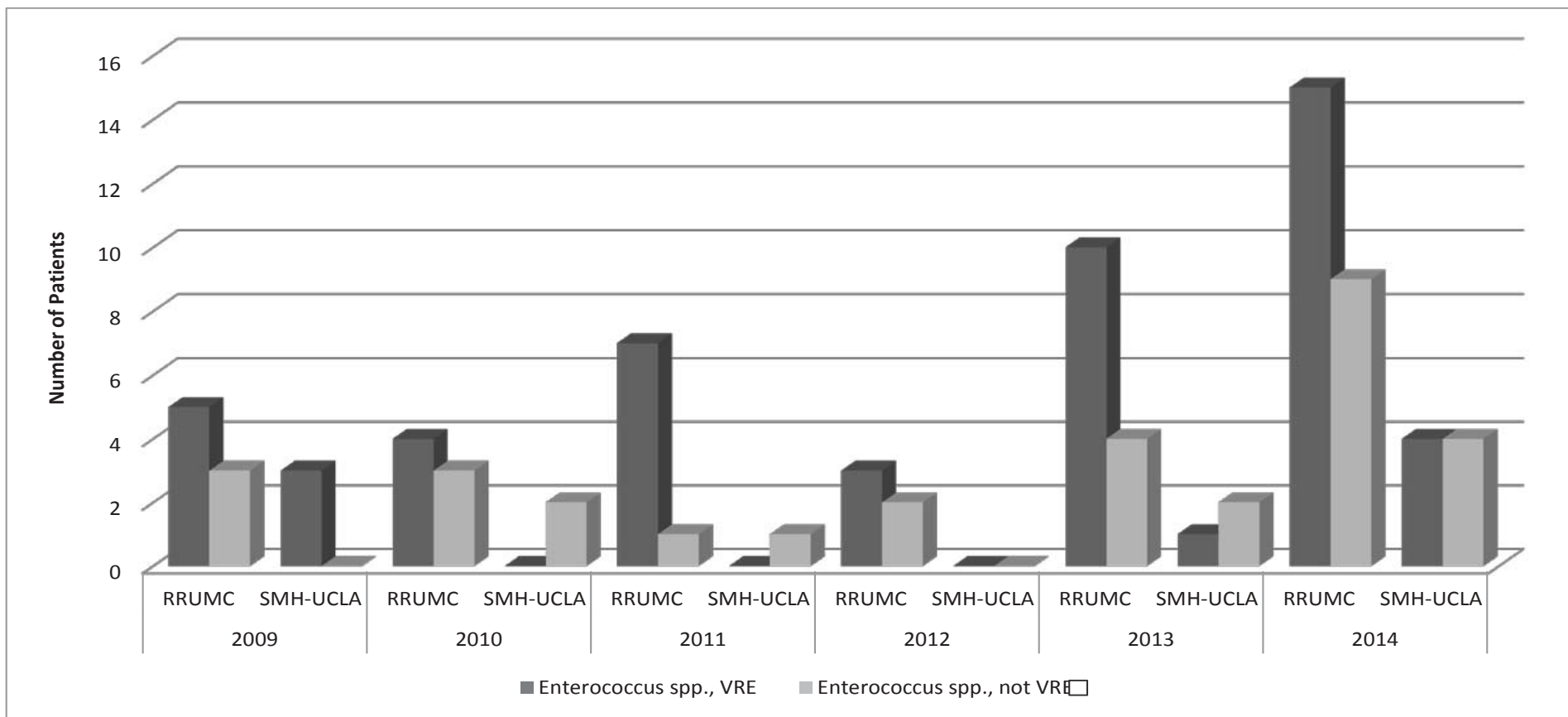
**Table 17. Carbapenem-resistant *Enterobacteriaceae* (CRE): RRUMC and SMH-UCLA, 2009-2014**



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<sup>1</sup> Includes isolates that produce carbapenemases such as KPC, NDM, and OXA-232

**Table 18. Daptomycin Non-susceptible Gram positive Cocci: RRUMC and SMH-UCLA, 2009-2014**



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Staphylococcus spp. are usually susceptible to daptomycin.

For 2013 RRH: there was 1 out of 552 daptomycin non-susceptible staphylococcus spp.

For 2013 SMH: there was 1 out of 180 daptomycin non-susceptible staphylococcus spp.

For 2014 RRH & SMH: 100% of staphylococcus spp. were daptomycin susceptible.

**Table 19. SMH-UCLA: Emerging Resistance Concerns**

Incidence of Resistant Organisms, 2013			
Organism	No. Isolates	Resistant to:	% Resistant
<i>Staphylococcus aureus</i> • Outpatient • Inpatient	628	Methicillin (MRSA)	42
	230		51
<i>Enterococcus</i> spp. (blood isolates only)	31	Vancomycin (VRE)	30

Beta-lactamase Results for Respiratory Pathogens		
Organism	No. Isolates	% beta-lactamase Positive <sup>1</sup>
<i>Haemophilus influenzae</i>	27 <sup>2</sup>	15
<i>Moraxella catarrhalis</i>	9 <sup>2</sup>	100

<sup>1</sup> Resistant to ampicillin, amoxicillin, penicillin

<sup>2</sup> Calculated from fewer than the standard recommendation of 30 isolates

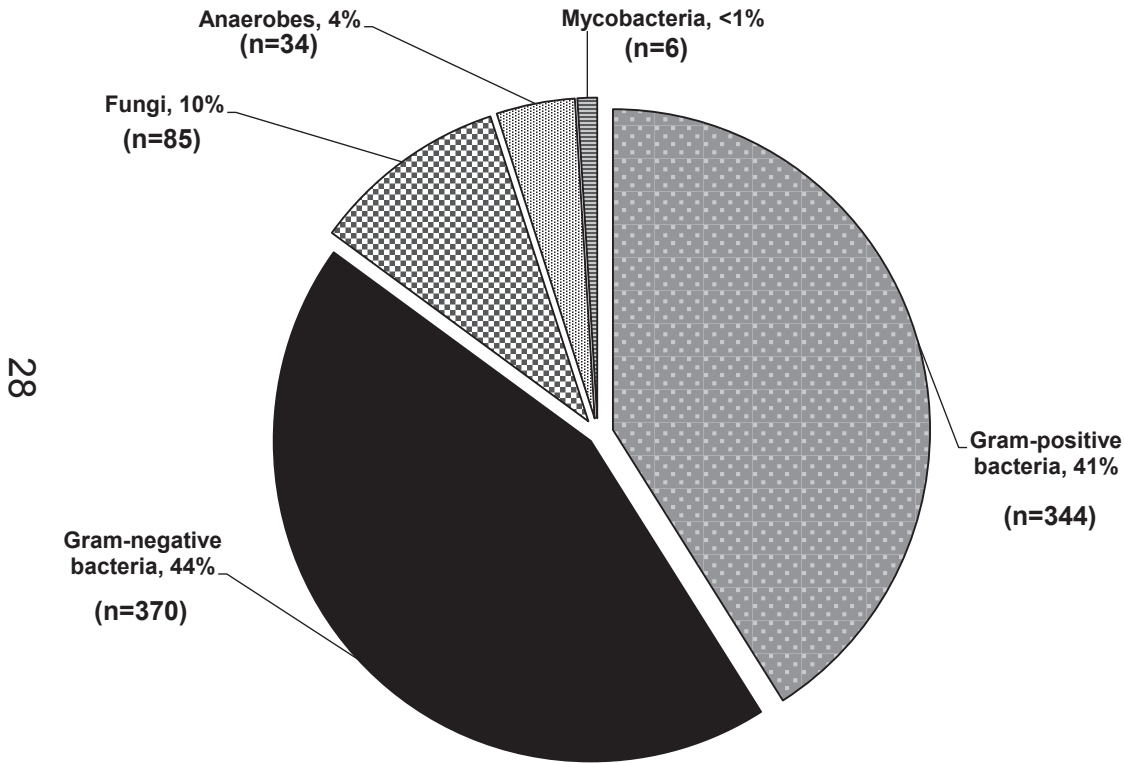


**Table 20. Treatment Suggestions for Organisms for which Susceptibility Testing is not Routinely Performed**

<b>Organism</b>	<b>First-line treatment</b>	<b>Alternate treatment</b>
<i>Bordetella pertussis</i>	Macrolide	Trimethoprim-sulfamethoxazole
<i>Campylobacter</i> spp.	Erythromycin, azithromycin	Doxycycline, fluoroquinolone, gentamicin
<i>Legionella</i> spp.	Levofloxacin, azithromycin +/- rifampin	Clarithromycin or doxycycline or trimethoprim-sulfamethoxazole +/- rifampin
<i>Mycoplasma pneumoniae</i>	Azithromycin	Doxycycline, fluoroquinolone
<i>Ureaplasma</i> spp.	Macrolide, doxycycline	

For additional information, refer to the Antimicrobial Stewardship website, [www.asp.mednet.ucla.edu](http://www.asp.mednet.ucla.edu)

**Table 21. RRUMC Blood: One Isolate per Patient, 2014**



Organism	n	% of Total Blood Isolates
1 <i>Escherichia coli</i> , 21% ceftriaxone R	132	16
2 <i>Enterococcus</i> spp., 47% VRE	127	15
3 <i>Staphylococcus aureus</i> , 35% MRSA	108	13
4 <i>Klebsiella</i> spp., 14% ceftriaxone R	79	9
5 Viridans group <i>Streptococcus</i>	56	7
6 Other <i>Enterobacteriaceae</i> spp.	45	5
7 <i>Pseudomonas aeruginosa</i>	35	4
8 <i>Candida albicans</i>	32	4
9 <i>Candida glabrata</i>	24	3
10 <i>Enterobacter cloacae</i>	21	3
Other isolates	199	23
<b>Total blood isolates</b>	<b>839*</b>	

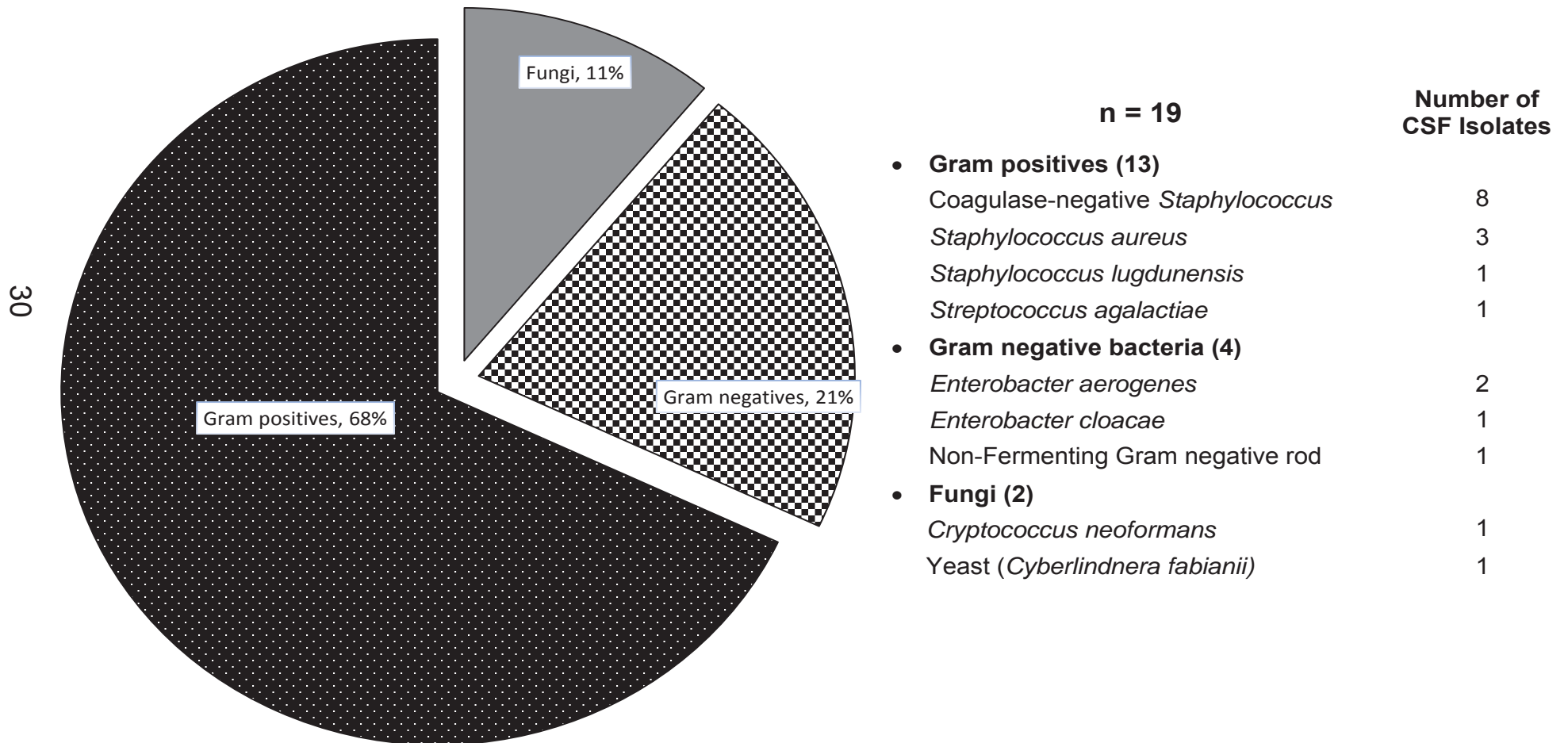
\*Excludes coagulase-negative staphylococcus (n=154), *Corynebacterium* spp. (n=10), *Bacillus* spp. (n=8), *Micrococcus* spp. (n=2), *Propionibacterium* spp. (n=1)

**Table 21. RRUMC Blood: One Isolate per Patient, 2014  
(cont.)**

**By Organism Group**

<b>Gram-positive Bacterial Isolates</b>			<b>% of Gram-positive Isolates</b>	<b>Fungal Isolates</b>		<b>n</b>	<b>% of Fungal Isolates</b>
<i>Enterococcus</i> spp., 45% VRE	127	37		<i>Candida albicans</i>	32	37	
<i>Staphylococcus aureus</i> , 27% MRSA	108	31		<i>Candida glabrata</i>	24	28	
Viridans group <i>Streptococcus</i>	56	16		<i>Candida parapsilosis</i>	10	12	
Other gram-positives (includes 6 <i>S. lugdunensis</i> )	28	8		<i>Candida krusei</i>	6	7	
Beta-hemolytic <i>Streptococcus</i>	18	5		<i>Candida tropicalis</i>	5	6	
<i>Streptococcus pneumoniae</i>	7	2		<i>Cryptococcus</i> spp.	3	4	
				Other yeast	4	5	
				<i>Fusarium</i> spp.	1	1	
				<i>Histoplasma capsulatum</i>	1	1	
<b>Total</b>	<b>344</b>			<b>Total</b>	<b>85</b>		
(excludes other coagulase –negative staphylococcus, <i>Corynebacterium</i> spp., <i>Bacillus</i> spp., <i>Micrococcus</i> spp.)							
<b>Gram-negative Bacterial Isolates</b>			<b>% of Gram-negative Isolates</b>	<b>Anaerobic Bacterial Isolates</b>		<b>n</b>	<b>% of Anaerobic Bacterial Isolates</b>
<i>Escherichia coli</i> , 21% ceftriaxone R	132	36		<i>Bacteroides</i> spp.	14	41	
<i>Klebsiella</i> spp., 14% ceftriaxone R	79	21		<i>Clostridium</i> spp.	5	15	
<i>Pseudomonas aeruginosa</i>	35	9		<i>Fusobacterium nucleatum</i>	5	15	
Other <i>Enterobacteriaceae</i> spp.	45	12		<i>Parvimonas micra</i>	3	9	
<i>Enterobacter cloacae</i>	21	6		<i>Eubacterium lentum</i>	2	6	
<i>Stenotrophomonas maltophilia</i>	13	4		<i>Fingoldia magna</i>	2	6	
<i>Acinetobacter</i> spp.	11	3		<i>Peptostreptococcus asaccharolyticus</i>	2	6	
Other gram-negatives	34	9		<i>Prevotella bivia</i>	1	2	
<b>Total</b>	<b>370</b>			<b>Total</b>	<b>34</b>		
				<b>Mycobacterial Isolates</b>		<b>n</b>	<b>% of Mycobacterial Isolates</b>
				<i>Mycobacterium avium</i> complex	2	33	
				<i>Mycobacterium mucogenicum</i>	2	33	
				<i>Mycobacterium fortuitum</i>	2	67	
				<i>Mycobacterium avium</i> complex	1	33	
				<b>Total</b>	<b>3</b>		

**Table 22. RRUMC CSF: One Isolate per Patient, 2014**



**Table 23. Mycobacteria, One Isolate per Patient per Source, 2014**

	# Patients By Source <sup>1</sup>					
	respiratory		blood		abscess/wound/ tissue/other	
	RRUMC	SMH- UCLA	RRUMC	SMH- UCLA	RRUMC	SMH- UCLA
<i>Mycobacterium tuberculosis</i> (21)	11	7	0	0	3	0
<i>Mycobacterium avium complex</i> (137)	81	38	1	3	9	5
<i>Mycobacterium gordonae</i> (16)	12	3	0	0	1	0
<i>Mycobacterium simiae</i> (2)	2	0	0	0	0	0
<i>Mycobacterium nonchromogenicum</i> (4)	2	2	0	0	0	0
<i>Mycobacterium kansasii</i> (3)	1	1	0	0	1	0
<i>Mycobacterium xenopi</i> (1)	1	0	0	0	0	0
<i>Mycobacterium asiaticum</i> (1)	1	0	0	0	0	0
<b>Rapid growers</b>						
<i>Mycobacterium abscessus</i> (13)	7	1	0	0	4	1
<i>Mycobacterium chelonae</i> (12)	5	0	1	1	4	1
<i>Mycobacterium fortuitum</i> (5)	3	1	0	0	0	1
<i>Mycobacterium perigrinum</i> (4)	4	0	0	0	0	0
<i>Mycobacterium mucogenicum</i> (2)	1	1	0	0	0	0
<i>Mycobacterium canariasense</i> (1)	1	0	0	0	0	0
<b>Total mycobacteria (222)</b>	<b>132</b>	<b>54</b>	<b>2</b>	<b>4</b>	<b>22</b>	<b>8</b>

<sup>1</sup> Some patients have isolates in more than one source

## Table 24. Mycobacteria Antimicrobial Susceptibility Testing

### 1. *Mycobacterium tuberculosis*:

Performed on first isolate per patient; performed on additional isolates recovered after 3 months, testing performed at reference lab.

#### Primary agents

ethambutol  
isoniazid (INH)  
pyrazinamide  
rifampin

#### Secondary agents

amikacin  
capreomycin  
ciprofloxacin  
ethionamide  
p-aminosalicylic acid  
streptomycin

In 2013, 27 (1.6%) of 1,758 *M. tuberculosis* cases in the State of California were MDR TB (resistant to at least INH and rifampin).

### 2. *Mycobacterium avium* complex:

Performed on first isolate per patient; performed on additional isolates recovered after 3 months, testing performed at reference lab.

Correlation between in vitro susceptibility and clinical response has been demonstrated only for clarithromycin. Clarithromycin results predict azithromycin results. Susceptibility testing for clarithromycin should be performed on isolates from patients only when failing prior macrolide therapy or prophylaxis.

### 3. Rapidly growing *Mycobacterium* spp. (e.g. *M. abscesses*, *M. chelonae*, *M. fortuitum* and *M. mucogenicum*):

Performed on one isolate per patient, testing performed inhouse. Additional agents on request.

#### Agents routinely reported

amikacin  
cefoxitin  
ciprofloxacin  
clarithromycin (inducible)  
doxycycline  
trimethoprim-sulfamethoxazole

#### Agents conditionally reported

imipenem  
linezolid  
meropenem  
moxifloxacin  
tigecycline  
tobramycin (*M. chelonae* isolates only)

### 4. Other Nontuberculous Mycobacteria (NTM):

*M. kansasii* – Performed on one isolate per patient, at reference lab.  
Other NTM by physician request.

**Table 25. Anaerobic Bacteria, % Susceptible**

Gram-negative anaerobic bacteria – antimicrobials listed in alphabetical order within percent susceptible categories<sup>1</sup>

Percent Susceptible	<i>Bacteroides fragilis</i>	Other <i>B. fragilis</i> Group <sup>2</sup>	<i>Fusobacterium nucleatum</i> and <i>F. necrophorum</i>	<i>Prevotella</i> spp.
>95	ertapenem, imipenem, meropenem, metronidazole, piperacillin-tazobactam	ertapenem, imipenem, meropenem, metronidazole	ampicillin, ampicillin-sulbactam, ceftiofur, clindamycin, ertapenem, imipenem, meropenem, metronidazole, moxifloxacin, penicillin piperacillin-tazobactam	ampicillin-sulbactam, ceftiofur, ertapenem, imipenem, meropenem, metronidazole, piperacillin-tazobactam
85–95	ampicillin-sulbactam, ceftiofur	piperacillin-tazobactam		
70–84	clindamycin			clindamycin, moxifloxacin
50–69	moxifloxacin	ampicillin-sulbactam		
<50		ceftiofur, clindamycin, moxifloxacin		ampicillin, penicillin

<sup>1</sup> Adapted from CLSI tables.

<sup>2</sup> *B. fragilis* group includes ssp. *distasonis*, *uniformis*, *vulgatus*, *ovatus*, and *thetaiotaomicron*.

**Table 25. Anaerobic Bacteria, % Susceptible (cont.)**

Gram-positive anaerobic bacteria – antimicrobials listed in alphabetical order within percent susceptible categories

Percent Susceptible	<i>Clostridium perfringens</i>	Other <i>Clostridium</i> spp.	<i>Propionibacterium acnes</i>	Anaerobic gram positive cocci
>95	ampicillin, ampicillin-sulbactam, cefoxitin, clindamycin, ertapenem, imipenem, meropenem, metronidazole, moxifloxacin, penicillin, piperacillin-tazobactam	ampicillin-sulbactam, ertapenem, metronidazole, piperacillin-tazobactam	moxifloxacin penicillin	ampicillin, ampicillin sulbactam, cefoxitin, ertapenem, imipenem, meropenem, metronidazole, penicillin, piperacillin-tazobactam
85–95			clindamycin	
70–84		ampicillin, moxifloxacin, penicillin		clindamycin, moxifloxacin
50–69		clindamycin		
<50		cefoxitin	metronidazole	

<sup>3</sup> Oral therapy. In cases of extraintestinal infection, Infectious Disease Consultation strongly recommended.



**Table 26. Antimicrobials (IV, PO), Formulary Status and Cost Reference**

<b>Drug</b>	<b>Usual Dose</b>	<b>Usual Interval</b>	<b>(\$)*Per Day</b>
<b>Penicillins</b>			
Ampicillin	1 gm	q6h	28.40
Ampicillin	2 gm	q6h	30.10
Ampicillin-sulbactam	3 gm	q6h	42.40
Oxacillin(24-hr infusion)	12 gm	q24h	71.70
Penicillin G	3x10 <sup>6</sup> units	q4h	53.60
Piperacillin-tazobactam (Extended 4-hr infusion)	3.375 gm	q8h	23.75
Ampicillin (PO)	500 mg	q6h	0.40
Amoxicillin (PO)	500 mg	q8h	0.25
Amoxicillin- clavulanic acid (PO)	500 mg	q8h	2.25
Dicloxacillin (PO)	500 mg	q6h	1.35
<b>Cephalosporins</b>			
Cefazolin	1 gm	q8h	8.30
Cefepime <sup>1,2</sup>	1 gm	q8h	21.00
Cefotaxime <sup>1,3</sup>	1 gm	q8h	19.40
Cefoxitin <sup>1,4</sup>	1 gm	q6h	30.15
Ceftriaxone	1 gm	q24h	9.00
Ceftriaxone	2 gm	q24h	15.75
Cephalexin (PO)	500 mg	q6h	0.45
Cefpodoxime (PO-UTI)	100 mg	q12h	8.45
Cefpodoxime (PO)	200 mg	q12h	10.40
<b>Carbapenems/monobactam</b>			
Aztreonam <sup>1,5</sup>	2 gm	q8h	197.90
Ertapenem <sup>1,6</sup>	1 gm	q24h	81.60
Meropenem <sup>1,7</sup>	1 gm	q8h	41.40
<b>Aminoglycosides</b>			
Amikacin <sup>1,8</sup>	1000 mg (15 mg/kg/dose)	q24h	16.50
Gentamicin	500 mg (7 mg/kg/dose)	q24h	10.95
Tobramycin <sup>1,9</sup>	500 mg (7 mg/kg/dose)	q24h	24.85

**Table 26. Antimicrobials (IV, PO), Formulary Status and Cost Reference (cont.)**

<b>Drug</b>	<b>Usual Dose</b>	<b>Usual Interval</b>	<b>(\$)*Per Day</b>
<b>Others</b>			
Azithromycin	500 mg	q24h	11.85
Ciprofloxacin	400 mg	q12h	4.40
Clindamycin	600 mg	q8h	48.95
Colistimethate	150 mg (CBA)**	q12h	31.90
Daptomycin <sup>1,10</sup>	500 mg	q24h	384.20
Doxycycline	100 mg	q12h	36.05
Levofloxacin <sup>1,11</sup>	750 mg	q24h	4.85
Linezolid <sup>1,12</sup>	600 mg	q12h	150.70
Metronidazole	500 mg	q8h	18.15
Quinu-/dalfopristin <sup>1,12</sup> (7.5 mg/kg/dose)	500 mg	q8h	841.40
Rifampin <sup>1,13</sup>	600 mg	q24h	172.05
Tigecycline <sup>1,10</sup>	50 mg	q12h	220.20
TMP/SMX***	320 mg TMP	q12h	44.05
Vancomycin	1 gm	q12h	14.00
Azithromycin (PO)	500 mg	q24h	2.75
Ciprofloxacin (PO)	500 mg	q12h	0.40
Clarithromycin (PO)	500 mg	q12h	9.05
Doxycycline (PO)	100 mg	q12h	6.45
Levofloxacin (PO) <sup>1,11</sup>	750 mg	q24h	0.50
Linezolid (PO) <sup>1,12</sup>	600 mg	q12h	261.35
Metronidazole (PO)	500 mg	q8h	2.05
Nitrofurantoin (PO) (macrocrystal formulation)	100 mg	q6h	7.90
Rifampin (PO)	600 mg	q24h	3.35
TMP/SMX (PO)	160 mg/800 mg	q12h	0.35
Vancomycin (PO)	125 mg	q6h	23.25

**Table 26. Antimicrobials (IV, PO), Formulary Status (cont.) and Cost Reference**

<b>Drug</b>	<b>Usual Dose</b>	<b>Usual Interval</b>	<b>(\$)*Per Day</b>
<b>Antifungal Agents</b>			
<b>Amphotericin B</b>	<b>50 mg</b>	<b>q24h</b>	<b>19.05</b>
<b>Amphotericin B<sup>1,10</sup> Liposomal (AmBisome)</b>	<b>350 mg</b>	<b>q24h</b>	<b>384.00</b>
<b>Caspofungin<sup>1,10</sup></b>	<b>50 mg</b>	<b>q24h</b>	<b>44.85</b>
<b>Fluconazole</b>	<b>400 mg</b>	<b>q24h</b>	<b>11.55</b>
<b>Voriconazole<sup>1,14</sup></b>	<b>300 mg</b>	<b>q12h</b>	<b>234.50</b>
<b>Fluconazole (PO)</b>	<b>400 mg</b>	<b>q24h</b>	<b>4.80</b>
<b>Flucytosine (PO)</b>	<b>2000 mg</b>	<b>q6h</b>	<b>1843.70</b>
<b>Voriconazole (PO)<sup>1,14</sup></b>	<b>200 mg</b>	<b>q12h</b>	<b>44.13</b>

\* Includes drug acquisition cost plus estimated preparation and administrative costs; charges rounded up to the nearest \$0.05

\*\* CBA: Colistin-base activity

\*\*\* TMP/SMX: Trimethoprim/Sulfamethoxazole

<sup>1</sup> Use of “controlled” antimicrobials is RESTRICTED to UCLA Health System-approved criteria.

<sup>2</sup> Restricted: suspected or documented *Pseudomonas aeruginosa* infection and in the management of gram-negative meningitis.

<sup>3</sup> For neonatal use only.

<sup>4</sup> Restricted: surgical prophylaxis; refer to Pre-incisional Antimicrobial Recommendations.

<sup>5</sup> Restricted: aerobic gram-negative infections in beta-lactam allergic patients.

<sup>6</sup> For Pediatric patients: restricted to use by Pediatric Infectious Diseases Service approval.

<sup>7</sup> Restricted: clinical deterioration on concurrent/recent antimicrobials or febrile neutropenia and/or overt sepsis in an immunocompromised patient.

<sup>8</sup> Restricted: organisms with suspected/documentated resistance to gentamicin and tobramycin.

<sup>9</sup> Restricted: infections caused by organisms with suspected/documentated resistance to gentamicin.

<sup>10</sup> Restricted to use by Adult or Pediatric Infectious Diseases Service approval.

<sup>11</sup> Restricted: all services, lower respiratory tract infections where RESISTANT organisms are suspected (e.g. penicillin- and cephalosporin-resistant *S. pneumoniae*).

<sup>12</sup> Restricted: suspected or documented VRE infection, documented allergy to vancomycin (not Redman’s Syndrome). Quinupristin-Dalfopristin has NO activity against *E. faecalis*

<sup>13</sup> Injection: For use in patients unable to tolerate the oral formulation.

<sup>14</sup> Restricted: treatment of suspected/documentated invasive aspergillosis. For treatment of infections caused by *S. apiospermum*, *Fusarium* species (including *F. solani*) and non-albicans *Candida* species in patients intolerant of, or refractory to other therapy.

## Table 27. Indications for Performing Routing Antimicrobial Susceptibility Tests - Aerobic Bacteria

Susceptibility tests will be performed as follows:

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1. **Blood—all isolates except\*:**
  - Bacillus* spp.<sup>1</sup>
  - Corynebacterium* spp.<sup>1</sup>
  - Coagulase-negative *Staphylococcus*<sup>1, 2</sup>
  - Viridians group *Streptococcus*<sup>1</sup>
  
2. **Urine**
  - >10<sup>5</sup> CFU/ml of (1 or 2 species)**
  - >50,000 CFU/ml of (pure culture):**
    - Gram-negative bacilli; *Staphylococcus aureus*
  
3. **Respiratory (sputum, nasopharynx, bronchial washing and tracheal aspirate):**
  - Moderate /many growth ≤2 potential pathogens
  - Cystic fibrosis patients: any quantity of gram-negative bacilli, *S. aureus*, *S. pneumoniae*
  
4. **Stool**
  - Salmonella* spp.<sup>3</sup> (≤ 3 mo. only)
  - Shigella* spp. (≤ 3 mo. only)
  - Yersinia* spp.
  - Vibrio* spp.

<sup>1</sup> Susceptibilities performed if isolated from multiple cultures

<sup>2</sup> Susceptibilities performed on all isolates of *S. lugdunensis*

<sup>3</sup> Susceptibilities performed on all isolates of *S. Typhi* and *S. Paratyphi*

\* neonates, susceptibilities performed on all isolates

**Table 27.      Indications for Performing Routing  
(cont.)          Antimicrobial Susceptibility Tests -  
                         Aerobic Bacteria**

5.    **Wounds, abscesses and other contaminated body sites, ≤2 potential pathogens.**
6.    **If isolate is from sterile body site, susceptibility testing will be performed on subsequent isolates from similar site(s) every 3 days. Exception: *S. aureus* and *P. aeruginosa* tested each day of collection from blood.**
7.    **If isolate is from non-sterile body site, susceptibility testing will be performed on subsequent isolates from similar site(s) every 5 days.**

**Additional notes:**

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- **Susceptibility tests will not be performed on more than two potential pathogens per culture unless specifically requested following discussion with clinician.**
- **Blood and CSF isolates are held for 1 year.**
- **Other potentially significant isolates are held in lab for 7 days. Contact lab at (310) 794-2758 within 48 hours if susceptibilities are desired.**

**Table 28. Antimicrobial Agents Routinely Reported - Aerobic Bacteria**

Primary antimicrobials	Conditions for supplemental antimicrobial reporting	Supplemental antimicrobial(s) <sup>1,4</sup>
<b><i>E. coli</i>, <i>Klebsiella</i> spp., <i>P. mirabilis</i> – Excludes urine isolates</b>		
ampicillin ceftriaxone	Resistant to ampicillin Resistant to ceftriaxone	ampicillin-sulbactam ciprofloxacin (>11 y.o.), ertapenem (>18 y.o.) or imipenem & meropenem (≤18 y.o.)
gentamicin piperacillin-tazobactam	Resistant to ertapenem (>18 y.o.) Resistant to gentamicin Resistant to piperacillin-tazobactam	imipenem, meropenem, ciprofloxacin (>11 y.o.) amikacin, tobramycin ertapenem (>18 y.o.) or imipenem (≤18 y.o.) & meropenem (≤18 y.o.)
trimethoprim-sulfamethoxazole		
<b><i>E. coli</i>, <i>Klebsiella</i> spp., <i>P. mirabilis</i> – Urine isolates</b>		
ampicillin cefazolin <sup>3</sup> ceftriaxone	Resistant to ceftriaxone Resistant to ertapenem (>18 y.o.)	ertapenem (>18 y.o.) or imipenem & meropenem (≤18 y.o.) imipenem, meropenem
ciprofloxacin(>11 y.o.) gentamicin nitrofurantoin piperacillin-tazobactam	Resistant to gentamicin Resistant to piperacillin-tazobactam	amikacin ertapenem (>18 y.o.), imipenem (≤18 y.o.) & meropenem (≤18 y.o.)
trimethoprim-sulfamethoxazole		
<b>SPICE organisms<sup>2</sup> – Excludes urine isolates</b>		
ampicillin ampicillin-sulbactam cefepime	Resistant to ampicillin Resistant to cefepime	ampicillin sulbactam imipenem & meropenem (≤18 y.o.), ertapenem (>18 y.o.), ciprofloxacin (>11 y.o.)
gentamicin piperacillin-tazobactam trimethoprim-sulfamethoxazole	Resistant to ertapenem (>18 y.o.) Resistant to gentamicin Resistant to piperacillin-tazobactam	ciprofloxacin, imipenem, meropenem amikacin, tobramycin ertapenem (>18 y.o.) or imipenem & meropenem (≤18 y.o.)
<b>SPICE organisms<sup>2</sup> – Urine isolates</b>		
ampicillin cefepime	Resistant to cefepime	imipenem & meropenem (≤18 y.o.) or ertapenem (>18 y.o.)
ciprofloxacin (>11 y.o.)	Resistant to ertapenem (>18 y.o.) Resistant to gentamicin	imipenem, meropenem amikacin
gentamicin nitrofurantoin piperacillin-tazobactam	Resistant to piperacillin-tazobactam	imipenem & meropenem (≤18 y.o.) ertapenem (>18 y.o.)
trimethoprim-sulfamethoxazole		

<sup>1</sup> The following antimicrobial agents are reported on carbapenem resistant gram-negative rods (resistant to meropenem and/or imipenem): Arithromycin, Fosfomycin, Minocycline, Moxifloxacin, Colistin, Tigecycline, Ceftazidime-avibactam and Ceftolozane-tazobactam.

<sup>2</sup> *Enterobacteriaceae* other than *E. coli*, *Klebsiella* spp., *P. mirabilis*, *Salmonella* spp., *Shigella* spp.

<sup>3</sup> Cefazolin results should only be used to predict potential effectiveness of oral cephalosporins for uncomplicated UTIs.

<sup>4</sup> Colistin is not reported on *Serratia marcescens*, *Proteius* spp., *Providencia* spp. and *Morganella morganii*.

**Table 28. Antimicrobial Agents Routinely Reported - Aerobic Bacteria (cont.)**

Primary antimicrobials	Conditions for supplemental antimicrobial reporting	Supplemental antimicrobial(s) <sup>†</sup>
<b><i>Salmonella</i> spp., <i>Shigella</i> spp. (if stool isolates, performed on patients ≤ 18 y.o. only)</b>		
ampicillin ciprofloxacin (>11 y.o.) trimethoprim-sulfamethoxazole	Non-fecal sources/resistant to all primary antimicrobials	ceftriaxone
<b><i>Pseudomonas aeruginosa</i></b>		
cefepime	Resistant to cefepime and piperacillin-tazobactam	imipenem, meropenem
ciprofloxacin (>11 y.o.) gentamicin piperacillin-tazobactam	If gentamicin > 1ug/ml Resistant to cefepime and piperacillin-tazobactam	amikacin, tobramycin imipenem, meropenem
<b><i>Acinetobacter</i> spp.</b>		
ampicillin-sulbactam cefepime ceftazidime ciprofloxacin (>11 y.o.)	Resistant to ceftazidime	imipenem, meropenem
gentamicin piperacillin-tazobactam trimethoprim-sulfamethoxazole	Resistant to meropenem or imipenem Resistant to gentamicin	minocycline & colistin amikacin, tobramycin
<b><i>Stenotrophomonas maltophilia</i>- Sterile body site isolates <i>Burkholderia cepacia</i></b>		
ceftazidime levofloxacin (>11 y.o.) meropenem ( <i>B. cepacia</i> only) minocycline ticarcillin-clavulanate trimethoprim-sulfamethoxazole		

**Table 28. Antimicrobial Agents Routinely Reported - Aerobic Bacteria (cont.)**

Primary antimicrobials	Conditions for supplemental antimicrobial reporting	Supplemental antimicrobial(s)
<b>Nonfermenting Gram Negative Rods not otherwise listed</b>		
cefepime ceftazidime ciprofloxacin (>11 y.o ) gentamicin piperacillin-tazobactam trimethoprim-sulfamethoxazole	Resistant to ceftazidime  If gentamicin >1ug/ml	imipenem, meropenem  amikacin, tobramycin
<b><i>Haemophilus influenzae</i></b>		
Beta-lactamase test	Sterile body site isolates: If beta lactamase positive If beta lactamase negative	ceftriaxone ampicillin, ceftriaxone



**Table 28. Antimicrobial Agents Routinely Reported - Aerobic Bacteria (cont.)**

Primary antimicrobials	Conditions for supplemental antimicrobial reporting	Supplemental antimicrobial(s)
<b><i>Staphylococcus</i> spp.</b> clindamycin <sup>3</sup>  oxacillin  penicillin vancomycin	Resistant to oxacillin (MRSA)   Urine isolates	doxycycline, rifampin, trimethoprim-sulfamethoxazole; all beta-lactams reported as resistant except ceftaroline  ciprofloxacin <sup>4</sup> , nitrofurantoin, trimethoprim-sulfamethoxazole
<b><i>Enterococcus</i> spp.</b> ampicillin vancomycin	Resistant to vancomycin (VRE) from sterile body sites  Sterile body site isolates Urine isolates	daptomycin, doxycycline, linezolid, quinupristin-dalfopristin (excluding <i>E. faecalis</i> ), rifampin  gentamicin & streptomycin synergy screens ciprofloxacin <sup>4</sup> , doxycycline, nitrofurantoin
<b><i>Streptococcus pneumoniae</i></b> amoxicillin, cefotaxime, ceftriaxone, doxycycline, erythromycin <sup>3</sup> , levofloxacin <sup>4</sup> , penicillin, tetracycline, trimethoprim-sulfamethoxazole, vancomycin		
<b>Viridans group <i>Streptococcus</i></b> cefotaxime, ceftriaxone, penicillin, vancomycin		
<b>beta-hemolytic streptococci</b> clindamycin <sup>3</sup> , penicillin, vancomycin		
<b><i>Listeria monocytogenes</i></b> penicillin, trimethoprim-sulfamethoxazole		

<sup>3</sup> excluding urine and sterile body site isolates

<sup>4</sup> patients >11 y.o.

**Table 29. Susceptible MIC ( $\mu\text{g/ml}$ ) Breakpoints for Aerobic Gram-negative Bacilli**

Organism	Penicillins				Cephalosporins					Carbapenems			Aminoglycosides			Fluoroquinolones		Other				
	Ampicillin	Ampicillin-sulbactam	Piperacillin-tazobactam	Ticarcillin-clavulanate	Cefazolin	Cefepime	Cefotaxime	Ceftazidime	Ceftriaxone	Ertapenem	Imipenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin <sup>1</sup>	Levofloxacin <sup>2</sup>	Colistin	Trimethoprim-sulfamethoxazole	Nitrofurantoin	Minocycline	Tigecycline
<b>ENTEROBACTERIACEAE<sup>3</sup></b>	$\leq 8$	$\leq 8$	$\leq 16$	-	$\leq 2$ <sup>4</sup>	$\leq 2$	$\leq 1$	$\leq 4$	$\leq 1$	$\leq 5$	$\leq 1$	$\leq 1$	$\leq 16$	$\leq 4$	$\leq 4$	$\leq 1$	$\leq 2$	$\leq 2$	$\leq 2/38$	$\leq 32$	-	$\leq 2$
<b>NONFERMENTERS</b>																						
<i>Acinetobacter baumannii</i>	-	$\leq 8$	$\leq 16$	-	-	$\leq 8$	$\leq 8$	$\leq 8$	$\leq 8$	-	$\leq 2$	$\leq 2$	$\leq 16$	$\leq 4$	$\leq 4$	$\leq 1$	$\leq 2$	$\leq 2$	$\leq 2/38$	-	$\leq 4$	-
<i>Burkholderia cepacia</i>	-	-	-	$\leq 16$	-	-	-	$\leq 8$	-	-	-	$\leq 4$	-	-	-	-	$\leq 2$	-	$\leq 2/38$	-	$\leq 4$	-
<i>Pseudomonas aeruginosa</i>	-	-	$\leq 16$	-	-	$\leq 8$	-	$\leq 8$	-	-	$\leq 2$	$\leq 2$	$\leq 16$	$\leq 4$	$\leq 4$	$\leq 1$	$\leq 2$	$\leq 2$	-	-	-	-
<i>Stenotrophomonas maltophilia</i>	-	-	-	$\leq 16$	-	-	-	$\leq 8$	-	-	-	-	-	-	-	-	$\leq 2$	-	$\leq 2/38$	-	$\leq 4$	-
<b>Other nonfermenters</b>	-	-	$\leq 16$	-	-	$\leq 8$	$\leq 8$	$\leq 8$	$\leq 8$	-	$\leq 4$	$\leq 4$	$\leq 16$	$\leq 4$	$\leq 4$	$\leq 1$	$\leq 2$	$\leq 2$	$\leq 2/38$	-	-	-

<sup>1</sup> *Salmonella* spp. breakpoint for ciprofloxacin  $\leq 0.06 \mu\text{g/ml}$

<sup>2</sup> *Salmonella* spp. breakpoint for levofloxacin  $\leq 0.12 \mu\text{g/ml}$

<sup>3</sup> *Enterobacteriaceae*: *Citrobacter freundii*, *Enterobacter* spp., *Escherichia coli*, *Klebsiella* spp., *Morganella morganii*, *Proteus mirabilis*, *Salmonella* spp., *Serratia* spp., *Shigella* spp.

<sup>4</sup> Non-urine isolates; break point for urine isolates is  $\leq 16$ . For urine isolates cefazolin interpretations (S, I, or R) predicts activity to oral cephalosporins. Oral cephalosporins include ceftodoxime and cephalixin for treatment of uncomplicated urinary tract infections.

**Table 30. Susceptible MIC (µg/ml) Breakpoints for Aerobic Gram-positive Cocci**

Organism	Penicillins			Cephalo- sporin	Aminoglycosides			Fluoroquin- olone	Other									
	Ampicillin	Oxacillin	Penicillin	Ceftaroline <sup>1</sup>	Gentamicin	Gentamicin synergy	Streptomycin synergy	Ciprofloxacin	Clindamycin	Daptomycin	Doxycycline	Erythromycin	Linezolid	Nitrofurantoin	Quinupristin- dalopristin	Rifampin	Trimethoprim - sulfamethoxazole	Vancomycin
<i>Staphylococcus aureus</i>	—	≤2	≤12 <sup>2</sup>	≤1	≤4	—	—	≤1	≤5	≤1	≤4	≤5	≤4	≤32	≤1	≤1	≤2/38	≤2
<i>Staphylococcus lugdunensis</i>	—	≤25	≤12 <sup>2</sup>	—	≤4	—	—	≤1	≤5	≤1	≤4	≤5	≤4	≤32	≤1	≤1	≤2/38	≤4
Coagulase-negative <i>Staphylococcus</i>	—	—	≤8	—	—	≤500	≤1000	≤1	—	≤4	≤4	—	≤2	≤32	≤1	≤1	—	≤4

<sup>1</sup> *S. aureus* only, including MRSA

<sup>2</sup> beta-lactamase negative

Organism	Penicillins		Cephalosporins		Tetracyclines		Other		
	Amoxicillin	Penicillin	Cefotaxime	Ceftriaxone	Doxycycline	Tetracycline	Erythromycin	Levofloxacin	Vancomycin
<i>Streptococcus pneumoniae</i>	—	—	—	—	≤25	≤1	—	≤2	≤1
Meningitis	—	≤0.06	≤5	≤5	—	—	—	—	—
Non-meningitis	≤2	≤2	≤1	≤1	—	—	≤25	—	—
Viridans group <i>Streptococcus</i>	—	≤12	≤1	≤1	—	—	—	—	≤1

## Table 31. Antimicrobial Stewardship

- 1) Treatment of asymptomatic bacteriuria
  - a. A urine culture must ALWAYS be interpreted in the context of the urinalysis and patient symptoms
  - b. If a patient has no signs of infection on urinalysis and no symptoms of infection, but a positive urine culture, the patient by definition has **asymptomatic bacteriuria**.
  - c. Patients with chronic indwelling catheters, urinary stoma, and neobladders will almost universally have positive urine cultures.
  - d. The only patient populations for which it is recommended to screen for and treat asymptomatic bacteriuria are **pregnant women** and **patients scheduled for a genitourinary surgical procedure**.
  - e. Avoid routine urine analysis and/or urine cultures for the sole purpose of screening for UTI in asymptomatic patients
- 2) Treatment of VRE Isolated from stool cultures
  - a. *Enterococcus* are normal bowel flora and do not cause enteric infections, regardless of vancomycin susceptibility
  - b. Antibiotic treatment of VRE in stool cultures is discouraged, and may lead to increased transmission by causing diarrhea and emergence of antimicrobial resistance among VRE
- 3) Treatment of *Candida* isolated from bronchoscopic samples in non-neutropenic patients
  - a. Isolation of *Candida*, even in high concentrations, from respiratory samples of immunocompetent patients, including bronchoscopy, should be interpreted as airway colonization.
  - b. Antifungal therapy should not be initiated unless *Candida* is also isolated from sterile specimens or by histologic evidence in tissue from at-risk patients.
- 4) Use of “double coverage” for gram-negative bacteria
  - a. “Double coverage” of suspected gram-negative infections serves the purpose of providing broad spectrum initial empiric coverage until susceptibility data are known.
  - b. No evidence exists to support the superiority of combination therapy over monotherapy for gram-negative infections once susceptibilities are known.
  - c. Once culture identification and susceptibilities have been reported, de-escalation to a single agent is strongly recommended.
- 5) Use of two agents with anaerobic activity to treat infections with potential anaerobic bacteria involvement
  - a. Double anaerobic coverage is not necessary and puts the patient at risk for additional drug toxicities. No data or guidelines support double anaerobic coverage in clinical practice.
  - b. Example: use of piperacillin/tazobactam + metronidazole
  - c. Two clinical exceptions are:
    - 1) addition of metronidazole to another agent with anaerobic activity to treat *Clostridium difficile* infection
    - 2) clindamycin added to another agent with anaerobic activity when treating necrotizing fasciitis

For additional information, refer to the Antimicrobial Stewardship website, [www.asp.mednet.ucla.edu](http://www.asp.mednet.ucla.edu)

## Rapid Reference

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**Lab Info**

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**Antimicrobial  
Stewardship  
Program**

### Resources at UCLA through the Antimicrobial Stewardship Program (ASP)

The Antimicrobial Stewardship Program (ASP) has made resources available for the sole purpose of improving clinical outcomes of patients with infections. Questions and guidance on interpretation of culture reports (contaminant/pathogen), drug dosing, etc. are welcome. The ASP can be contacted numerous ways, depending on the urgency and clinical needs:

ASP helpdesk: (310) 267-7567

Email: [asp@ucla.edu](mailto:asp@ucla.edu)

Website: <http://www.asp.mednet.ucla.edu>

Note that the website has a **guidebook**, with detailed information about specific clinical syndromes, interpretation of microbiology reports, and guidelines for treatment.

eConsult: <http://www.asp.mednet.ucla.edu/pages/econsult>

We encourage you to reach out to the program with questions. The program is staffed by Dr. Daniel Uslan (ID), Dr. Jennifer Curello (Pharm – RR), Dr. Meganne Kanatani (Pharm – RR), and Dr. Zahra Kassamali (Pharm-SMH).

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